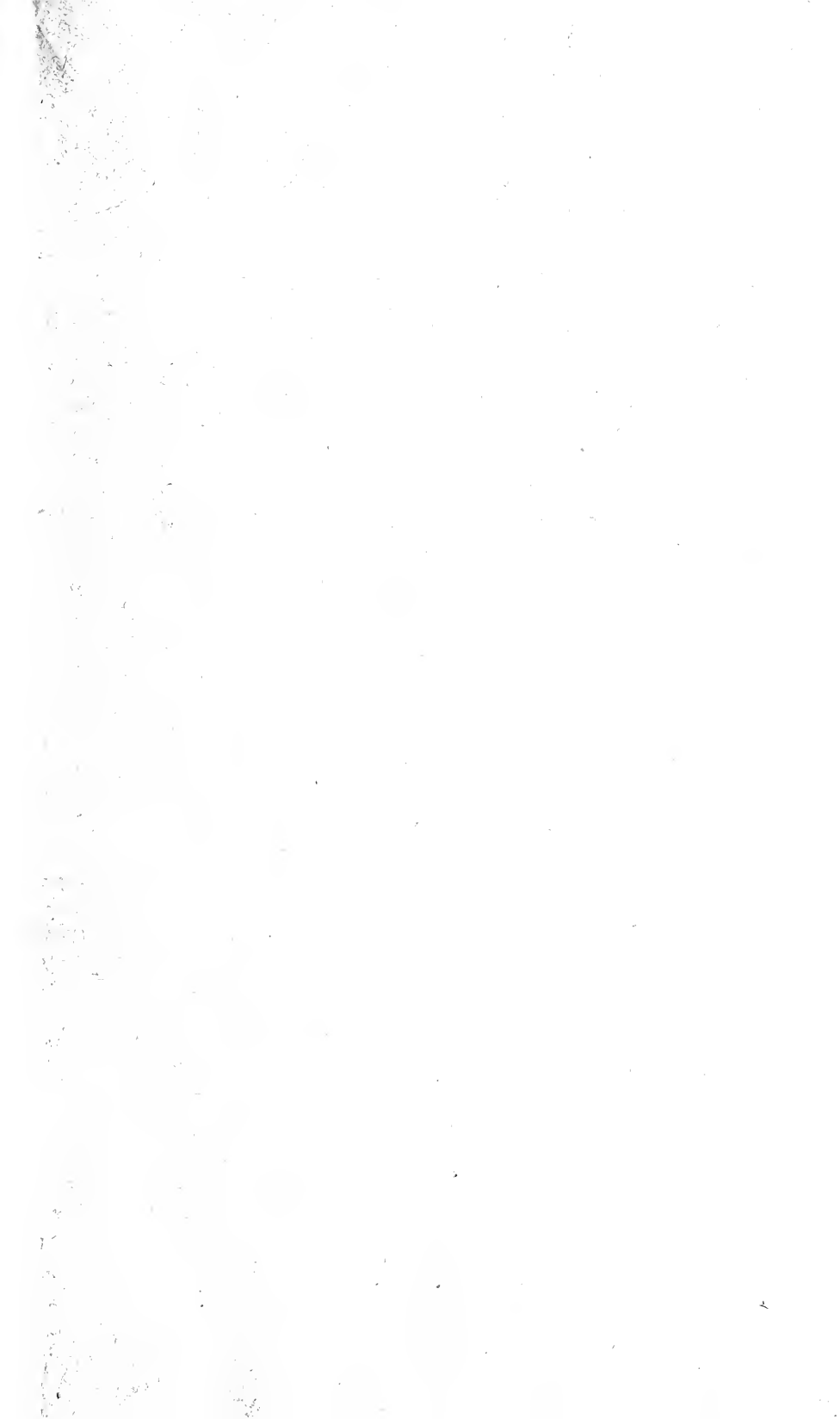
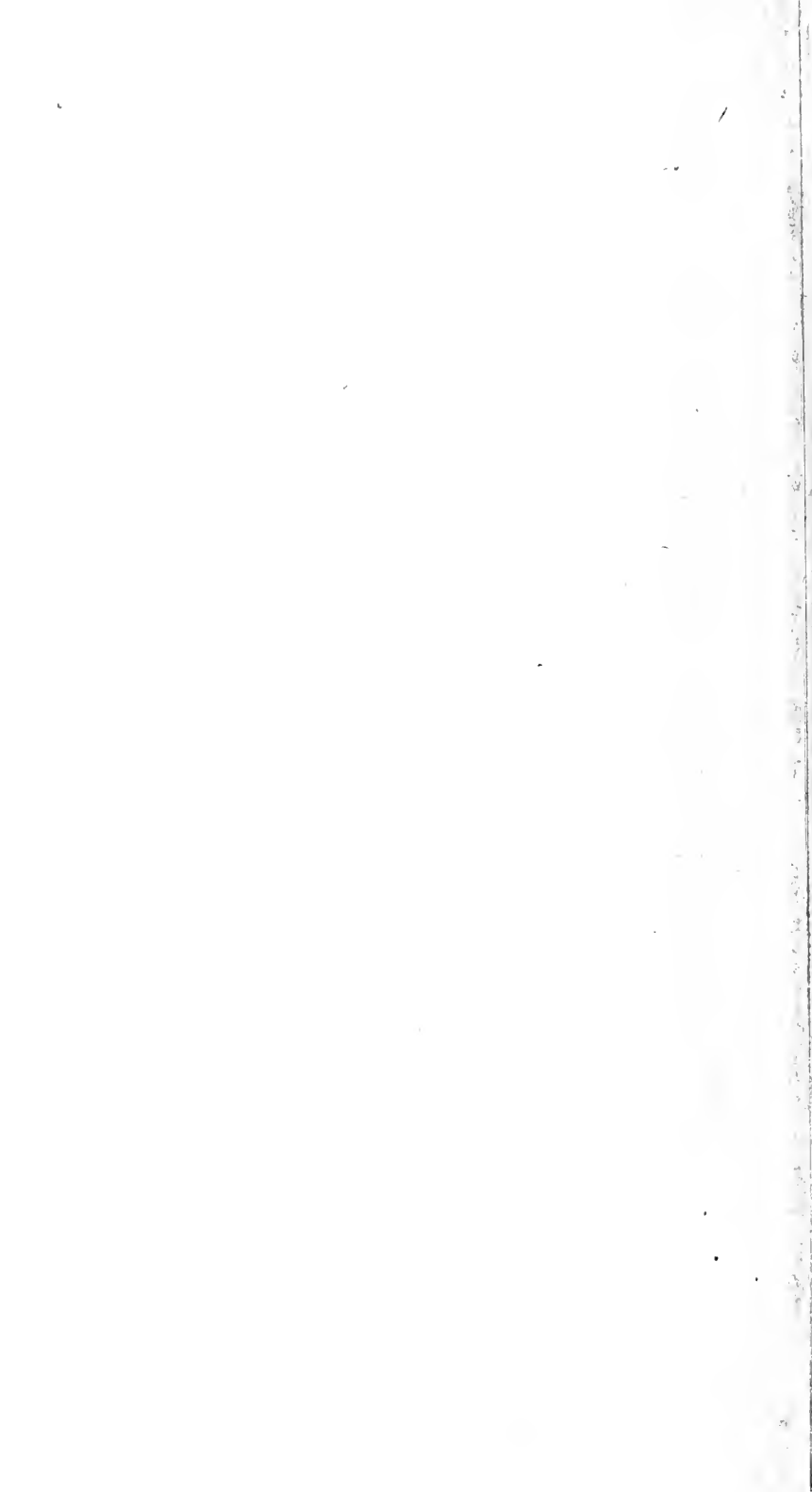




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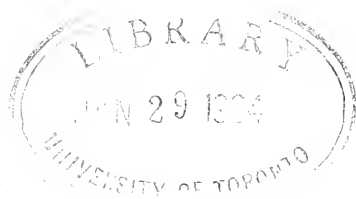




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The labor of consultation will be much reduced by the catch-words in bold-faced type at the top of the page, being the first and last titles of the pages which face each other; and by the full title-words on the back of the volume, being the first and last titles contained therein.

The word *ante* refers to Chambers's Encyclopædia, as represented in this issue. Whenever the word (*ante*) follows a title in the American additions, it indicates that the article is an enlargement of one under the same title in Chambers's Encyclopædia—usually to be found immediately preceding.

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VEGETABLE CHEMISTRY, or the chemistry of plants, is so extensive a subject that it is impossible here to give much more than an enunciation of the most important propositions, without entering into full proofs or details. On submitting to incineration a plant which has been dried at a moderate heat till it ceases to lose weight, we find that the residue, which consists of mineral salts and a little carbon, is much lighter than the original plant, the portion which is burned off, or apparently lost, corresponding to the organic constituents of the plant. Hence every plant, like every animal, is composed of *organic* and *mineral* or *inorganic constituents*. While the mineral constituents of the plant are also found in the crust of the earth, the organic constituents are primarily formed in the plant itself from inorganic matters, viz., from *water*, *atmospheric air*, and the *soil*, which collectively may be termed the food of plants.

The following general principles may be laid down regarding the organic constituents which mainly contribute to form the bulk of the body of the plant: (1.) All organic constituents of plants contain *carbon*. (2.) All such organic constituents contain *hydrogen*. Some of them, as, for example, many ethereal or volatile oils, consist solely of these two elements. (3.) The greater proportion of these compounds contain *oxygen* in addition to the two preceding elements. To this class belong those constituents of plants which are at the same time of the most general diffusion and of the greatest physiological and economic importance; namely, the so-called *carbo-hydrates*, which consist of carbon combined with hydrogen and oxygen in the exact proportion in which the last two elements form water. Under this title are included cellulose, starch, gum, etc. Other organic constituents contain not only carbon with hydrogen and oxygen in the above ratio, but an excess of oxygen. In this category may be placed almost all the *organic acids*, many *etheral oils*, *wax*, the *resins*, many of the so-called *glycosides*, and the *fats*. (4.) With the above elements, *nitrogen* is associated, to form two very important groups of constituents, viz., the *organic bases* or *alkaloids*, and the *albuminates* or *proteine bodies*. Although the nitrogenous groups never form more than a small part of the mass of a plant, nitrogen is never altogether absent from a plant. (5.) In association with all the above-named elements, *sulphur* in small quantity is present in the albuminates of all plants; in association only with carbon and hydrogen, it occurs in oil of garlic and oil of asafetida; and when combined with carbon, hydrogen, and nitrogen, it has been as yet only found in oil of mustard. Whether *phosphorus* in very minute quantity occurs in any of the vegetable albuminates, is still uncertain.

The inorganic constituents which are found in the ashes of all plants are: *potash*, *soda*, *magnesia*, and *lime*, in combination with *phosphoric*, *sulphuric*, *hydrochloric*, and *carbonic acids*, and additionally, *iron*, *manganese*, and *silica*, with traces of *fluorine*; while the marine plants or sea-weeds contain also appreciable quantities of *bromine* and *iodine*. *Alumina* and *baryta* are also occasionally found, as also are *nitrates* in certain plants. The carbonates almost always found in the ash are, as is well known, for the most part formed by the action of the incineration upon the salts of the vegetable acids, such as the acetates, citrates, etc., and probably in some other respects, the arrangements of the constituents of the ash are not precisely identical with those of the mineral ingredients while existing in the actual plant. Among the most essential of the inorganic constituents is *water*, which acts as a solvent for the matters dissolved in the vegetable juices, and forms a very preponderating part of the mass, sometimes amounting to from 86 to 96 per cent of the whole plant. From the preceding remarks, it is obvious that the nutrition and development of plants is dependent on their absorbing *carbon-compounds*, *hydrogen-compounds*, *nitrogen-compounds*, *sulphur-compounds*, *water*, and such *inorganic compounds* as yield the necessary inorganic constituents in a form capable of assimilation; together with the presence of *oxygen*, which is required for the formation of organic oxygenous compounds.

The assimilation of *carbon* first claims our attention. The composition of the atmospheric air, from whatever part of the earth's surface it is taken, is, as is well known, constant, in so far as the relative volumes of oxygen and nitrogen are concerned; while

the variations in the carbonic acid, except when there are obvious causes for an excess (as, for example, an over-crowded room), are very slight, and, as a general rule, deviate scarcely at all from 4 volumes in 10,000 of air. Yet causes disturbing this uniformity are perpetually at work. Prof. Mulder, adopting Lavoisier's and Davy's experiments, according to which a man consumes about 26 cubic ft. of oxygen in 24 hours (and later observers place the daily quantity at 45 cubic ft.), calculated his yearly consumption at more than 9,500 feet. Considering the enormous numbers of men and animals on the surface of the globe, and the lamps, fires, furnaces, etc., ever burning, the atmosphere would apparently soon cease to be fit for the support of life (1) in consequence of the great diminution of oxygen, a gas essential to life, and (2) in consequence of the great excess of carbonic acid, a gas deleterious to life. The cause of this marvelous uniformity of atmospheric air under these circumstances is that function of plants by which they absorb their carbon. It is to the experiments and observations of Priestley in 1771, Ingenhousz in 1776, Senebier in 1807, and many later observers, that we are indebted for the knowledge of the great general fact, that plants take up the carbonic acid from the air, reduce it in their organism, and retain the carbon for the composition of their own organisms, while they restore the oxygen gas to the atmosphere. It is chiefly by the leaves, which may be regarded as the respiratory organs, that this process is carried on. It is needless here to notice the questions as to whether it is only during light, or constantly, that these changes go on; whether different rays of the spectrum act with more or less power in liberating the oxygen, etc. Independently of the proof afforded, for example, by placing green plants in a mixture of 70 parts of common air and 30 parts of carbonic acid, and finding that, in the course of four hours, the carbonic acid has been almost entirely replaced by oxygen, we have obvious evidence in the case of lichens growing on a naked rock, that the carbon which they contain must be obtained from the atmosphere. In the case of aquatic plants, the process is identical, the atmospheric air being dissolved in the water. Carbon, in some form of combination or other, probably forms about two-thirds of the weight of a dried plant. The assimilation of *hydrogen* from the decomposition of water in and by the plant, is not capable of the same direct proof as that of carbon; but there are strong grounds for believing in its occurrence. This view is supported by the composition of wax, the resins, volatile oils, etc., and indeed it is difficult to see from what other source the hydrogen could be derived. In that case, the water, like the carbonic acid, contributes its oxygen to the air. The *nitrogen*, which enters into certain constituents of plants, is derived from ammonia, and not, as might have been supposed, directly from the air, of the volume of which it forms about four-fifths. It has been shown by the direct observations of Boussingault, that plants cannot assimilate nitrogen, that those which have been made to absorb it by placing their roots in nitrogenous water, throw it off unchanged, and that vegetation cannot exist in a soil which contains no substances readily convertible into ammonia. The indifference of nitrogen to other elements, and the extreme readiness with which ammonia becomes decomposed, and enters into different combinations (the amides, imides, amido-acids, compound ammonias, and probably also the albuminates, being derivatives of it), together with the conclusion we draw from the action of liquids containing ammonia, or matter convertible into it, as gas-liquid, fluid sewage, etc., confirm this view. The ammonia taken up by plants is obtained partly from the air, and partly from the soil. In the air it is formed after thunderstorms, and it is further supplied to the atmosphere by putrefactive processes, animal excretions, and volcanic action. It is indeed found in snow and in all rain-water, and is thus conveyed to the soil. Although direct experiments show that the air contained in the pores of the soil is richer in ammonia than ordinary atmospheric air, it is easy to show that a plant can derive its ammonia from the latter alone, by a reference to the vegetation on naked rocks, or by growing plants in powdered charcoal duly moistened with rain-water. Hence both air and soil contribute the ammonia from which the nitrogen is fixed in the plant. The *oxygen* which occurs in the various constituents of the plant is derived from the decomposed carbonic acid and water, and corresponds to the difference between the amount contained in those absorbed compounds and the amount liberated to the atmosphere. The *sulphur* that occurs in the albuminates and certain ethereal oils must be derived from the soil, since it does not occur either free or in combination in the air; and as the only form in which it is found in common soil is as sulphates, plants must have the property of decomposing these salts, and appropriating their sulphur after reduction. Extensive experience has proved that certain *inorganic constituents* are as indispensable to the life and development of the plant as the organic elements we have been considering; and further, that special plants require special inorganic constituents, as is shown in works on agricultural chemistry. The two following facts seem well established: (1) that the roots of plants exert a special selective power, and absorb some salts, and reject others that are also in solution in the water of the soil; and (2) that the top or vegetable soil has the power of absorbing and retaining the most necessary mineral ingredients, and does not allow them to be carried deep into the ground by the rain; but for the discussion of this subject we can only refer to the experimental researches of Liebig, Mulder, Huxtable, Way, etc. It would be altogether out of place to enter into the consideration of the prodigious synthetic and analytic power of the vegetable cells; we shall merely indicate how some of the most important

vegetable compounds are probably formed; beginning with the *vegetable acids*. "Even," says prof. Gregory, "when carbonic acid and water are brought together in the cell, this is not enough. There must be present, first, albuminous matter, without which no active cell can exist; secondly, mineral matter, especially alkalies, phosphates, and salts. All these conditions being fulfilled, and light being admitted, we may suppose the first organic acid formed to be oxalic acid, the least complex of all."—*Organic Chemistry*, 4th ed. p. 541. Putting it in the briefest terms, the cell separates 2 equivalents of oxygen from 2 equivalents of carbonic acid, and yields 1 equivalent of *anhydrous oxalic acid*, or $C_2O_3 - O_2 = C_2O$. Two equivalents of dry oxalic acid, $C_2H_4O_6$, by taking up 2 equivalents of water, and losing 8 equivalents of oxygen, yield *hydrated malic acid*, $C_4H_6O_{10}$. *Tartaric* and *citric acids* are capable of a similar production. Thus, 2 equivalents of dry oxalic acid, combining with 2 of water, and losing 6 of oxygen, yield hydrated tartaric acid ($C_4H_6O_{12}$, or $C_2H_4O_{10} \cdot 2H_2O$); and similarly, 3 equivalents of dry oxalic acid, combining with 2 of water, and losing 12 of oxygen, yield hydrated citric acid ($C_{12}H_8O_{14}$, or $C_{12}H_5O_{11} \cdot 3H_2O$). In like manner every vegetable acid, and every one of the neutral compounds of carbon, hydrogen, and oxygen, may be derived from some less complex compound, containing more hydrogen than itself; or it may be supposed to be derived directly from carbonic acid and water, oxygen being, on every supposition, given off. "As the proportion of oxygen to carbon diminishes, the acids become weaker, till the oxygen exactly suffices to form water with the hydrogen, when we have either very feeble acids, or neutral bodies, such as sugar, gum, and starch. As the oxygen is still further diminished, we have neutral, bitter, and acrid compounds, or colored bodies, or such as yield coloring matters, with ammonia and oxygen; further on still we have aromatic oils, and volatile, quasi-resinous, crystallizable acids; then resins; and lastly, when all the oxygen is expelled, certain oils, which are carbo-hydrogens."—Gregory, *op. cit.*, p. 543. Although each individual substance is doubtless in reality derived from some substance only a little less complicated than itself, the final result, in so far as showing their mode of construction is concerned, is the same as if they were all obtained directly from carbonic acid and water. The following tabular view (compiled by Gregory) will serve to show how all the leading groups of vegetable compounds are produced from carbonic acid and water by deoxidation:

SUBSTANCES FORMED.						
	Name.	Formula.	= Carbonic acid.	+ Water.	- Oxygen.	
1.	<i>Vegetable Acids</i> —					
	Tartaric acid.....	$C_4H_6O_{12}$	= $8CO_2$	+	6H ₂ O	= 16O
	Malic acid.....	$C_4H_6O_{10}$	= $8CO_2$	+	8H ₂ O	= 13O
	Citric acid.....	$C_{12}H_8O_{14}$	= $12CO_2$	+	8H ₂ O	= 18O
2.	<i>Carbo-hydrates</i> —					
	Cellulose.....	$C_{12}H_{10}O_{10}$	= $12CO_2$	+	10H ₂ O	= 24O
	Starch.....	$C_{12}H_{10}O_{10}$	= $12CO_2$	+	10H ₂ O	= 24O
	Cane-sugar.....	$C_{12}H_{22}O_{11}$	= $12CO_2$	+	11H ₂ O	= 24O
3.	<i>Other Neutral Bodies</i> *—					
	Mannite.....	$C_{12}H_{14}O_{12}$	= $12CO_2$	+	14H ₂ O	= 26O
	Salicine.....	$C_{26}H_{18}O_{14}$	= $26CO_2$	+	18H ₂ O	= 56O
	Pectine.....	$C_{25}H_{21}O_{24}$	= $25CO_2$	+	21H ₂ O	= 53O
	Hematoxylene.....	$C_{22}H_{14}O_{12}$	= $22CO_2$	+	14H ₂ O	= 66O
	Elaeterine.....	$C_{60}H_{25}O_{18}$	= $60CO_2$	+	25H ₂ O	= 157O
4.	<i>Oxygenated Volatile Oils, and Allied Acids</i> —					
	Oil of bitter almonds.....	$C_{14}H_6O_2$	= $14CO_2$	+	6H ₂ O	= 32O
	Benzolic acid.....	$C_{14}H_6O_4$	= $14CO_2$	+	6H ₂ O	= 30O
	Oil of cinnamon.....	$C_{15}H_8O_2$	= $15CO_2$	+	8H ₂ O	= 42O
	Cinnamic acid.....	$C_{15}H_8O_4$	= $15CO_2$	+	8H ₂ O	= 40O
5.	<i>Oily and Fatty Acids</i> —					
	Acetic acid.....	$C_4H_4O_2$	= $4CO_2$	+	4H ₂ O	= 8O
	Butyric acid.....	$C_8H_8O_2$	= $8CO_2$	+	8H ₂ O	= 20O
	Valerianic acid.....	$C_{10}H_{10}O_4$	= $10CO_2$	+	10H ₂ O	= 36O
	Stearic acid.....	$C_{36}H_{36}O_4$	= $36CO_2$	+	36H ₂ O	= 104O
6.	<i>Resins and Camphors</i> —					
	Many resins.....	$C_{10}H_7O$	= $10CO_2$	+	7H ₂ O	= 26O
	Camphor.....	$C_{10}H_8O$	= $10CO_2$	+	8H ₂ O	= 27O
	Borneo camphor.....	$C_{20}H_{18}O_2$	= $20CO_2$	+	18H ₂ O	= 56O
7.	<i>Carbo-hydrogens</i> —					
	Oil of lemons.....	C_5H_4	= $5CO_2$	+	4H ₂ O	= 14O
	Oil of turpentine.....	$C_{10}H_8$	= $10CO_2$	+	8H ₂ O	= 28O
	Oil of juniper.....	$C_{16}H_{12}$	= $15CO_2$	+	12H ₂ O	= 42O
	Cumole.....	$C_{18}H_{12}$	= $18CO_2$	+	12H ₂ O	= 48O
	Cymole.....	$C_{20}H_{14}$	= $20CO_2$	+	14H ₂ O	= 54O

A glance at the composition of these seven groups shows that they present a series of deoxidations, till in the sixth, very little oxygen, and in the last, no oxygen whatever is left. Thus, leaving out of view, for want of space, the compounds in which nitrogen and sulphur enter, "oxalic acid is first formed, and then malic, tartaric, citric, etc., acids from it or from each other; then sugar, starch, etc., from the acids; bitter, acrid, and colored compounds from the sugar, starch, etc.; then oxygenated volatile oils; and then acids perhaps also from sugar, etc.; then the oily and fatty acids, either from the preceding oils and acids, or from sugar; then the resins from the fats, or from sugar; and lastly, the carbo-hydrogens. Thus, we have a picture of the whole process of vegetation

* In this group, which is very numerous, compounds of a most discordant character appear. Of the specimens we have selected, the first closely resembles a sugar; the second is a pure bitter; the third, a gelatinizing substance; the fourth, a pigment; and the fifth, an acrid poison.

as far as concerns compounds devoid of nitrogen and sulphur; and we find it uniformly to be one of deoxidation."—Gregory, *op. cit.*, p. 548. To produce nitrogenous compounds, such as asparagine, amygdaline, nicotine, morphine, caffeine, etc., it is only additionally necessary that ammonia should be present, and the plant by a similar process gives rise to nitrogenous products, the process being shown as below:

Asparagine.....	$C_8H_{16}N_2O_8$	=	$8CO_2 + 4HO + 2NH_3 - 12O$
Amygdaline.....	$C_{10}H_{16}N_2O_2$	=	$40CO_2 + 24HO + NH_3 - 82O$
Nicotine.....	$C_{10}H_{14}N_2$	=	$20CO_2 + 8HO + 2NH_3 - 48O$
Morphine.....	$C_{17}H_{19}NO_6$	=	$34CO_2 + 16HO + NH_3 - 80O$
Caffeine.....	$C_8H_{10}N_4O_2$	=	$16CO_2 + 4NH_3 - 28O$

It is easy to show how the sulphur contained in certain oils (oil of garlic, C_6H_5S , for example) is probably obtained by the reduction of the sulphuric acid existing in the sulphates of the soil; but the composition of the albuminates containing both sulphur and nitrogen is so complex that we cannot venture to attempt a popular explanation of the mode of formation of these matters from the simple food of plants. On this subject the reader may consult Liebig's *Agricultural Chemistry*, *Letters on Chemistry*, and *Laws of Husbandry*; Mulder's various works (a new edition of his great work is now being translated, in parts, into German); Rochleder's *Phytochemie*, and the portion of Gregory's *Organic Chemistry*, and of the third volume of Goup-Besanez's *Handbuch der Chemie*, devoted to this question.

VEGETABLE IVORY. See **IVORY**, **VEGETABLE**.

VEGETABLE MARROW. See **GOURD**.

VEGETABLE PARCHMENT. See **PARCHMENT**, **VEGETABLE**.

VEGETABLE PHYSIOLOGY. All the most important departments of this subject have been already noticed in this work under the various headings of **CIRCULATION OF SAP**, **FLOWER**, **FRUIT**, **LEAVES**, **METAMORPHOSIS OF ORGANS**, **PLANT**, **ROOT**, **SEED**, **SPORE**, **STEM**, etc. We shall therefore here only discuss one subject, which has not been separately considered—namely, the organs and functions of reproduction in plants. Although, as we learn from Herodotus, the Babylonians knew that there were male and female date-trees, and that the female required the concurrence of the male to become fertile, and Theophrastus in his work *On the History of Plants*, and other ancient authors, frequently mention the sexes of plants, Cæsalpinus, who died at Rome in 1603, seems to have been the first writer who directed his attention to the reproductive organs of plants; and he speaks vaguely of an emanation from the male causing fertility in the female; and Grew, in 1676, seems to have been the first who distinctly recognized the functions of the stamens and pistils. Ray, in his *Historia Plantarum*, 1694, adopted and enforced Grew's view; and Geoffroy, in 1711, read a memoir before the royal academy supporting the same view. Linnæus, in his *Systema Nature* (1748), made these organs the foundation of his system of classification into sexual and non-sexual plants, the former being phanerogamous, or flowering, and the latter cryptogamous, or flowerless; in the latter division of plants, he could not detect stamens or pistils; and it was not till 1782, when Hedwig's work on mosses was published, that anything was known with certainty regarding the sexual organs of any of the cryptogamia. From this brief notice of the early history of this subject, we proceed to the consideration of reproduction in the phanerogamous plants. A complete flower consists, as is well known, of four whorls (*verticils*), placed alternately within one another, the two internal being the *stamens* (q.v.) and *pistils* (q.v.), which are the essential organs of reproduction; while the two external are the *calyx* and *corolla*, which constitute the floral envelopes or protective coverings.

Both the stamens and the pistils originate, like the floral envelopes (see **FLOWER**), from the thalamus, or upper part of the axis or peduncle, in the form of minute cellular processes; and in their development they resemble leaves, although in their appearance, they are less like leaves than are the floral envelopes. These parts are well seen in the accompanying diagram (fig. 1) of the flower of the vine, after it has cast its petals. There are here five stamens (the filament of one being concealed by the pistil), with introrse* two-lobed anthers. As separate articles are devoted to **STAMENS** and **PISTILS**, it is unnecessary to enter into any details regarding their anatomical structure. A few additional remarks on the pollen are, however, called for. This (the male fertilizing agent) consists of cells contained in the anther case, and is discharged by various kinds of longitudinal, transverse, valvular, or porous dehiscence. When examined by the naked eye, it usually appears as a yellow powder; but when magnified, it is found to consist of cellules of different singular forms, varying in size from $\frac{3}{100}$ to $\frac{7}{100}$ of an inch in diameter. Oval, spherical, and triangular forms of pollen are shown in figs. 2 to 6; and they may be square cylindrical hour-glass shaped, etc. These pollen-grains are developed in the large cells in the early stage of the anther. The contents of each cell

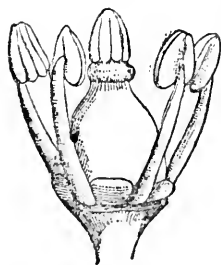


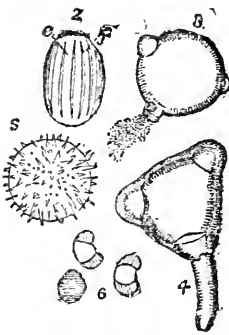
FIG. 1.

Andrœcium and gymnoecium (or, in other words, the stamens and pistil) of the vine, with the disk surrounding the base of the ovary.

developed in the large cells in the early stage of the anther. The contents of each cell

* This term is applied to anthers which open on the side next the pistil.

divide first into two, and afterward into four parts, each of which becomes covered with cellulose, so as to constitute independent cells or grains. These grains either burst through the parent cell, and become liberated, or they remain united in fours or some multiple of four, as in many species of acacia; or, in large masses, such as those seen in orchids and in asclepias, when they constitute *pollinia*. Each pollen-grain has usually two coverings: the outer one, called *extine*, being a firm membrane, often marked with bands or rough points; and the inner one called *intine*, which is thin, and capable of extension. In the interior of the pollen-grains, a minute granular matter exists, called *fovilla*—the granules, which are mixed with starch and oil, varying from $\frac{1}{30000}$ to $\frac{1}{300000}$ of an inch in diameter. On moistening pollen-grains in water, they swell till the intine bursts at one or more points, and expels the fovilla. In the act of impregnation the pollen is scattered on the pistil, and is moistened on one side by the fluid of the stigma (a part of the pistil composed of loose cells, which secrete a viscid fluid, and are uncovered by epidermis). It is then observed that the intine, instead of bursting, protrudes in the form of a tube called the *pollen-tube*. The number of these tubes varies greatly in different plants. According to Amici (as quoted by Balfour, to whose useful *Class-book* we are indebted for most of our facts and illustrations), the two pollinia of *orchis morio* contain each about 200 secondary small masses, composed of grains united in fours, and each of these small masses presents 300 openings capable of emitting tubes. In order that an embryo plant



FIGS. 2 to 6.

Fig. 2.—Elliptical pollen of milkwort (*polygala*), viewed lengthwise. Its surface, or extine, *e*, is marked with grooves or slits, *f*, where the intine protrudes. Fig. 3.—Ripe round pollen of cherry (*cerasus*) discharging its fovilla through a tubular opening formed by the intine. There are two other points at which the intine is seen protruding. Fig. 4.—Triangular pollen of evening primrose (*arctothera*), with one pollen tube protruding. This tube is formed by the intine, which is also seen projecting at the other angles. Fig. 5.—Round ripe pollen of hollyhock (*alcea*), with its extine, covered with prominent points. Fig. 6.—Pollen of fir (*pinus*), in which, by the increase of the intine, the extine is separated into two hemispherical portions marked by the dark spaces at each end of the grains.

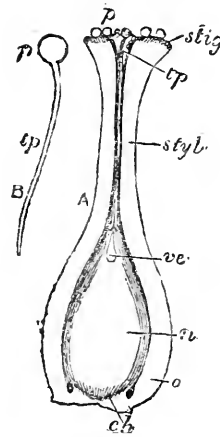


FIG. 7.

Pistil and pollen of polygonum. A, stigma, *stig.*, with pollen-grains, *p*, adherent to it, sending tubes, *tp*, down the conducting tissue of the style, *styl.*; the ovary, *o*, containing the ovule with its covering and central cellular mass or nucleus, *n*, containing a rudimentary embryo-sac *re*, in which ultimately the embryo is developed. The base of the ovule attached to the placenta, is marked by the chalaza, *ch*. B, pollen-grain, *p*, separated, with pollen-tube, *tp*.

may be formed, the mature pollen must be discharged from the anther cells of the stamen, and brought into contact with the stigma, through which, and then through the conducting tissue of the style, it must pass until it reaches the foramen, or micropyle, of the ovule. The means by which this contact is accomplished are various, such as elasticity and irritability of the stamens, the action of currents of air, and the intervention of insects passing from the male to the female plant. In the case of the orchids, fertilization is solely effected by the agency of insects. The fertilizing power of pollen is retained for a different length of time in different plants: thus, while in most species of *datura*, and in *lychnis dioica*, it loses its power in two days, in the wall-flower it remains efficacious for 14 days; while in the date, cannabis, tea, and camellia, it will keep fresh for a year; indeed, Micheaux mentions that the pollen of the date has been successfully used after 18 years! The quantity of pollen that is produced is much greater than is actually required for the impregnation of the ovules. Thus, in the firs and pines, the quantity is enormous, probably because of the obstacles here presented to fertilization. The *sulphur showers* occurring in some districts are composed of the yellow pollen carried by the winds from pine forests; and the showers of colored rain which are occasionally noticed are due to a similar cause. The number of pollen grains in certain flowers has been calculated. In a plant of *cercus grandiflorus*, Morren observed that there were 40 flowers, each containing 500 stamens, and that each anther contained 500 pollen-grains; hence the entire number of pollen-grains in each flower was 250,000, and in the

whole plant is 10,000,000. Similarly, in an entire rhododendron plant, the pollen-grains amount to 72,620,000. The quantity required for fertilization is very small—one, two, or at most three grains being sufficient to impregnate one ovule. In most cases, the pollen of a single anther is sufficient for complete impregnation; the additional anthers being, as it were, added for the purpose of insuring the result. During the evolution of the stamens, and the maturation of the pollen, the pistil undergoes certain changes, of which the most important is that the stigma becomes enlarged, lax, and covered with a viscid secretion, which, besides detaining the pollen-grains, causes them to protrude their tubes, as already described; moreover, in some flowers the style, which is sometimes covered with hairs, elongates during the discharge of the pollen, brushes the latter on to the pistil, and thus acts directly in fecundation. One of the central cells of the ovule now becomes much enlarged and developed, so as to form the embryo sac. At the end of this sac, next to the micropyle, several free nucleated cells are formed, to which the name of embryo vesicles, or germinal vesicles, has been given. In this way the ovule is prepared for the action of the pollen, and for the production of the embryo plant. The tubes developed by the pollen grains, when acted on by the secretion of the stigma, pierce the stigmatic tissue, and carry the fovilla through the canal of the style to the ovule, as shown in fig. 7. In some plants the emission of tubes begins in half a minute after the pollen has been caught by the stigmatic secretion; in other cases it does not begin for 24 hours or more; and it is said that in the larch, the tubes do not emerge for 35 days. The length to which the tubes extend is often very great, but the diameter is extremely small. In *colchicum autumnale*, in which the style is 13 in. long, the length of the tube is 9,000 times the diameter of the grain from which it proceeds. The time taken by the tube to traverse the length of the style varies, but does not always correspond with the latter. In some short-styled plants, the time is very long, while in the long-styled *colchicum autumnale*, the pollen-tube reaches the ovule in about 12 hours. In some coniferous plants a year is required for the process.

We now proceed to consider the embryogeny of (1) gymnospermous and (2) angiospermous phanerogams. In the gymnospermous or naked-seeded flowering plants, such as the coniferae and cycadaceae, impregnation is effected by direct contact between the pollen and the ovule, there being no true ovary bearing a stigma. The process is thus

summarized by Balfour: "In gymnospermous plants, there are stamens containing pollen, and ovules supported on cones or altered branches, and in them the pollen enters the large micropyle of the ovule without the intervention of stigma or style. When the pollen reaches the nucleus of the naked ovule, it remains long dormant, and after many weeks and months, sends out a tube which reaches the embryo sac, and impregnates a corpuscle. One of the cells of the corpuscle then takes an active function, and develops the embryo with the suspensor in the midst of endospermial cells."—*Op. cit.*, p. 609. In the angiospermous phanerogams, when the pollen-tube has traversed the tissue of the style, and reached the ovule, it proceeds through the foramen, or micropyle, so as to come in contact with the embryo sac; and consequent on this is the development of the cellular embryo. There is, however, much dispute as to what now occurs. "Schleiden thinks that the end of the pollen-tube introverts the embryo sac, and in some cases perforates it, and that it becomes the first cell in the embryo. Most physiologists, however, agree in thinking that Schleiden was mistaken in regard to the extremity of the pollen-tube, and they believe that the embryo is formed from a distinct cell previously existing in the embryo sac. In some instances, the pollen-tube indents the embryo sac, at other times it perforates it, and comes into actual contact with a cell contained in the sac. In the embryo sac there are produced, before impregnation, certain cells, often three, which are called germinal vesicles, only one of which in general is impregnated by the pollinic fluid, which transudes through the membrane of the pollen-tube and the walls of the embryo sac and vesicles. After impregnation, the vesicle divides by a transverse septum into two parts, the upper portion forming a coniform partitioned filament or suspensor, and the lower becomes filled with cells, constituting the rudimentary embryo. The suspensor is attached to the part which forms the radicle of the embryo, and at the opposite end, one or two cotyledons are produced, enclosing the fresh bud or plumule. An embryo is usually produced



FIG. 8.

Section of part of the ovule of a species of Spæckwell (*Cecoclea triphylla*), showing the pollen-tube, *a*, passing through the cellular tissues of the nucleus, and reaching the embryo sac, which contains the rudimentary embryo, *d*, attached to the sac by its suspensor, *b*, and endospermial cells, *c*, at the lower part of the sac.

in each ovule (monembryony); but when more than one germinal vesicle is impregnated, there is a plurality of embryos (polyembryony). When the pollen of one species is applied to the pistil of another species, we occasionally find seeds produced which give rise to individuals intermediate between the two parents: these individuals are called hybrids or mules, and are rarely fertile. A plant has, however, a preference

for the pollen of its own species, and hence hybrids are rare in nature."—Balfour, *op. cit.*, p. 600. A reference to the preceding figure of a section of part of the ovule of a species of *Spadicell*, will elucidate the above summary; it shows the pollen-tube *a*, just as it reaches the embryo sac which contains the rudimentary embryo, *d*, attached to the sac by its suspensor, *b*, and endospermial cells, *c*, at the lower part of the sac. The suspensor is sometimes of considerable length, and as much as three, or even five times the length of the whole seed. Its attachment to the radicular end of the embryo is shown in fig. 8. In monocotyledons, a single sheathing cotyledon is developed; in dicotyledons, two opposite leaves; and after their formation, the apex produces the terminal bud or plumule. The embryo is thus suspended in an inverted position in the seed.

It is impossible to enter into any general description of the organs or process of reproduction in cryptogamic plants. In this great division of the vegetable kingdom, the organs of reproduction are in general obscure, and consist usually of cellular sacs of two kinds—one being called *antheridia*, containing *phytozoa* or *spermatozooids*, representing the stamens, or the male; and the other being called *pistillidia* or *archegonia*, and representing the pistil, or the female. In the fully developed state of the plant, the antheridia disappear, while the pistillidia are transformed into cellular sacs containing germinating bodies known as spores (q.v.), which are considered as being formed by a process of reproduction, and as being analogous to cellular embryos. These spores are developed in mother-cells, the contents of which often divide into four, such mother-cells being called sporidia. With regard to the antheridia and the pistillidia in the different orders of cryptogamic plants, Dr Balfour observes that in ferns they are supposed to exist in a pro-thallus or cellular expansion produced by the spore when it germinates. A cell of the pistillium (the ovular body) afterward gives rise to the spore-bearing leaves (the fronds). After impregnation, the archegonial cells give rise to a springiferous frond. The spores are contained in sporangia, with or without an elastic ring, developed on the back, on the side, or at the base of the leaves. In mosses, these organs are seen at certain stages of the plant's growth, and they are either on the same or on different plants. After impregnation, the archegonial cell gives rise to a stalked theca or sporangium with its spores. In liverworts, they are usually on different parts of the plant, and as frequently in the substance or on the under surface of disk-shaped cellular stalked expansions. Here the impregnated cell gives rise to the fruit or capsules. In lichens, the existence of these organs has not been already established; and the fructification consists of *thecæ* or *asci*, containing 4, 8, 12, or 16 sporidia (or cells containing spores) in their interior. These thecæ are usually united together so as to form a cup-like mass of fructification. When mature, the sporidia or thecæ burst, and discharge the spores. The fungi, antheridia, and pistillidia are obscure, and the organs of reproduction are spores which are either naked or are contained in thecæ. In algae, antheridia and pistillidia have often been detected; but in some of them, certain cells, in the same or separate filaments, seem to possess the property of producing spores by a process of conjugation or union; and in the lowest forms the cells undergo division into new individuals.

Besides the above-noticed modes of propagation, cryptogamic plants are also propagated by buds or gemmæ, which are either attached to the leaves or fronds, or are contained in peculiar cup-shaped bodies. See Carpenter's *General and Comparative Anatomy*, and Balfour's *Class-book of Botany*, from which we have borrowed freely.

VEGETABLE TISSUE, the term employed in botany to denote the whole substance of which plants consist; regarded according to its structure, rather than to functions or chemical composition. See **CELLULAR TISSUE** and **VASCULAR TISSUE**.

VEGETARIANISM, the doctrine that vegetable substances are the solids intended by nature for the sustenance of man, and that it is wrong—against nature and against good morals—for men to make use of an animal diet. There have never been wanting among speculative persons some who maintained that fruits and vegetables are the proper food for men; and illustrious names, such as those of Pythagoras, Plato, Plutarch, in ancient times—of Rousseau, Shelley, Swedenborg, in modern, can be counted among the upholders of this doctrine. A society for promoting the practice of vegetarianism was established at Manchester in 1847; and three years later, a similar society was established in the United States. Besides a short-lived publication called the *Vegetarian Advocate*, the vegetarians in Great Britain have been represented by the *Vegetarian Messenger* (monthly), from 1849 to 1859; for one year by the *Journal of Health*; from 1861 to 1871 by the *Dietetic Reformer* and *Vegetarian Messenger* (quarterly); and since 1871 by the *Dietetic Reformer* (monthly). The vegetarian creed has attracted very few disciples in England; and by these the advocacy of it has usually been conjoined with that of temperance, peace, homeopathy, and the cold-water cure.

There is, first, a physiological argument used in behalf of vegetarianism. It is said that the formation of the teeth and of the intestines in man proves that man was not intended to be a carnivorous, but a fruit and vegetable eating animal. Then it is maintained that a vegetable diet is the most favorable to man, in all respects, physical, intellectual, and moral; that with it, his life is longer, his enjoyment of life greater, his brain more vigorous, and his power of manual labor not less than with an animal diet; and that,

while the use of animal food begets ferocious dispositions, a carelessness about life, a callousness to the sufferings of men or animals, a vegetable diet "develops the gentler affections, and produces a broad and genial sense of brotherhood." It is affirmed that animal food produces febrile and inflammatory tendencies; that, like alcohol, it is a stimulant (some vegetarians call it a stimulating poison); and that a mixed diet is open to all the objection which lie against moderate drinking. It is also alleged that animal food as exposed for sale is often tainted with some disease or unwholesome condition, and that it thus becomes a frequent cause of disease in men. Moreover, it is submitted that vegetables contain all the principles necessary for the sustenance of man; that, therefore, the use of flesh is unnecessary; and that this being so, it is selfish, cruel, and tyrannical—calculated, too, to increase selfishness, cruelty, and tyranny in men—to cut short the existence of inferior animals.

The opinion of physiologists is not favorable to vegetarianism. The structure of man's organs is held to prove that nature intended him for an omnivorous animal, his stomach and intestines being fitted for deriving nourishment from every kind of food, and he being able, by means of cooking, to modify his food so as to prepare it for mastication and digestion. There is also almost a concurrence of medical experience against vegetarianism, and in favor of the opinion that man, as regards all his powers and faculties, thrives best, and that—if a difference can be made out—he also lives longest upon a mixed diet. It has been found, in making railways, that differences between workmen in respect of bodily strength and energy were chiefly due to a difference of diet; that, for example, a beef eating Englishman would almost do the work of three vegetable fed Frenchmen, and that this difference of working-power disappeared when the Frenchmen took to eating beef. Upon the alleged beneficent moral influence of vegetable food, it may be observed that there is no proof whatever of its reality; moreover, that since the majority of mankind live either mostly or entirely upon vegetables, vegetables must bear a large share of the responsibility which may fall upon diet for the evil tendencies of man, and that, in fact, the most cruel and the most debased of human races live entirely upon vegetables. To the charge of cruelty brought against the practice of killing animals for food, it has been answered, that the plan of nature contemplates such cruelty—if cruelty it be—and makes it impossible to avoid it; that the microscope has shown us that even in taking a draught of water we may deprive a multitude of beings of life; and that, on the other hand, the system of rearing cattle for the butcher—since the cattle would otherwise not be reared at all—really adds very largely to the sum of happy animal existence. It is not disputed that there is a liability to disease from the use of unwholesome meat; but, then, vegetables as well as animals are subject to diseases; and the reasoning which would drive us from the use of animal food because it may be diseased, would really cut us off from food altogether.

VEGLIA, an island of Austria, in the Adriatic sea, belonging to the crown-land of Illyria; pop. 15,000. The channel of Moracca separates it from the main-land and the islands of Cherso and Plannich on the s.w. It is 24 m. long and 12 m. in width. The coast is bold and rocky. The surface is mountainous and well timbered, and the soil in the s. and w. is fertile, producing wine and a variety of fruits. The chief mineral product is marble, and the principal industries are connected with the fisheries. On the s.w. coast is the town of Veglia, with a harbor and fort.

VEHMGERICHTE. See **FEMGERICHTE**.

VEHSE, KARL EDUARD, 1802-70; b. Germany; appointed head of archives department at Dresden in 1833. He traveled in the United States in 1839, was expelled from Prussia for his remarks about the royal family in his *Geschichte der deutschen Höfe Seit der Reformation*, 1851-58, and naturalized in Switzerland in 1857. He published *Geschichte Kaiser Otto's des Grossen* in 1828.

VEII, an ancient city of Etruria in early times the formidable rival of Rome. Its very site is disputed, but is now generally thought to be at *Isola Farnese*, about 12 m. from Rome. The struggle between the two cities is recorded by Roman historians to have commenced as early as the time of Romulus, and to have continued under each of the kings, except the pacific Numa, and always to the advantage of the Romans. The Veientes had their revenge so far under Porserna; but after his time, being convinced by repeated defeats that they were no match for their enemy in the open field, they had recourse to the plan of sheltering themselves behind their walls on the approach of the Roman legions, and of sallying out on predatory expeditions as soon as they had retired. To relieve the republic from this annoyance, the Fabian clan, to the number of 306, with their followers, probably ten times as numerous, undertook to garrison a fortress near Veii, and act as a guard against the marauders. They were, however, enticed into an ambuscade, and cut off to a man at the Cremera. For the next 60 years, hostilities often broke out, followed by ill-observed truces. At last, the Romans determined to rid themselves of their rival by a siege, and persevered with great tenacity, though the city held out for ten years, and repeated attempts were made by the neighboring states to relieve it. It is said to have been taken at last by a mine, which was directed so as to lead into the citadel. The citizens were massacred or sold as slaves, and the land confiscated. The fall of Veii took place 396 B.C. It was debated more than once, especially after the destruction of Rome by the Gauls, whether Rome should

not be abandoned, and Veii made the capital. After its fall, it was gradually deserted; and although, in later times, a colony was planted there by Cæsar, and again by Augustus, it always remained an insignificant place. There are remains of the Etrurian, and also of the Roman city, which have latterly been traced out and described.

VEIL. This familiar article of dress is one of the most ancient in use; its origin is lost in remoteness, but we find an allusion to the wearing of veils by the Chinese in Ovid, and Juvenal speaks of women as being so delicate as to be overheated by a silken veil. Although generally considered portions of female dress, we read in the works of Ambrose (374 A.D.), of "silken garments and veils interwoven with gold, with which the body of the rich man is encompassed." Its use is now so extended that it may be found in every part of the civilized world, but almost exclusively confined to women.

VEINS, in anatomy, if we except the pulmonary, the portal, and the umbilical veins, are the vessels which carry back venous blood from the capillaries, and enlarging as they proceed, finally pour it through the ascending and descending *vena cava* into the right auricle of the heart. See CIRCULATION. Their coats are similar to those of the arteries, but much thinner, and even transparent. They are, however, of considerable strength. The *intimal coat* consists of an epithelial layer, supported on several laminae of longitudinal elastic fibers. The *middle* or *contractile coat* consists of numerous alternating layers of muscular and elastic fibers, the muscular fibers being disposed circularly round the vessel. The muscular fibers are wanting in some parts of the venous system, and specially developed in others (as, for example, the splenic and portal veins, where, perhaps from the physical character of the tissues which they pervade, there may be more than the ordinary resistance to the passage of the blood). In the *vena cava* and pulmonary veins near the heart, striped muscular fibers may be detected, continuous with those in the auricles. The *external or areolar fibrous coat* consists of connective or areolar tissue, and of longitudinal elastic fibers; within some of the larger veins, as the inferior *vena cava*, through its whole length, the external iliacs, the azygos, etc., there is also a longitudinal net-work of unstriped muscular fibers. The existence of valves in the veins is mentioned in the article CIRCULATION. These valves are most numerous in the veins of the extremities, especially the lower ones, these vessels having to act against the force of gravity more than most others. They are absent in the *vena cava*, the hepatic, portal, renal, pulmonary, and some other large veins, and in very small veins generally. The veins are nourished by nutrient vessels, or *vasa vasorum*, like the arteries; but except in a few instances (including the inferior *vena cava*), nerves are not distributed to them.

The chief diseases of the venous system have been already sufficiently described in the articles PILEBITIS, or INFLAMMATION OF THE VEINS; PHLEBOLITES; PHLEGMASIA ALBA DOLENS, or MILK-LEG; THROMBUS; and VARICOSE VEINS. We shall here merely refer to two conditions of the venous system which must be regarded as the results of natural rather than morbid action: they are *hypertrophy* and *atrophy*. Hypertrophy is a natural and healthy change, which will be readily understood by one or two illustrations. When the uterus enlarges during pregnancy, the quantity of blood in it increases in at least a corresponding ratio, and so also do the venous canals by which it is removed; while shortly after delivery, they return to their natural size; the hypertrophy being accompanied with a proportionate dilatation. This form of hypertrophy, with dilatation, often exerts a compensative action, one vein, or set of veins, taking additional work (and consequently requiring and increase of caliber), to make up for the partial or entire occlusion of another. When, for example, the ascending *vena cava* is diminished in size, or even entirely and permanently closed, it is well known that the lower portion of the vessel dilates in common with the branches entering into it, and that the superficial abdominal veins or azygos, or both, become enlarged, and thus carry to the heart the blood which ought to have reached the heart by the usual course. If the obstruction is only temporary, the enlarged veins return to their original state, except that additional transverse fibers are found in the middle coat. Atrophy of the veins accompanies the corresponding changes of other tissues, when a part is permanently diseased. Amputation above the knee soon reduces the femoral vein to less than one-third of its previous size. Mr. Callender, in his article on "diseases of the veins," in Holmes's *System of Surgery*, states that in the case in which a kidney became transformed into a large cyst, the canal of the renal vein was impervious to a common probe; and this condition is daily seen in the change which occurs in the umbilical vein shortly after birth.

VEINS, in geology, are crevices, more or less vertical, caused by the contraction during drying or metamorphoses, or by the mechanical disturbance of a rock, which have been filled by materials different from the body of the rock. Veins containing substances that have been injected in a state of fusion from heat, have had their origin in some internal force; while those filled with mineral deposits may or may not be connected with upheaval. Granitic and trappean veins differ from dykes chiefly in the greater size of the latter. They produce similar changes in the rocks which they penetrate, indurating clays and sandstones, and converting limestones into marble, or giving them a compact texture like hornstone. Granite veins are generally more sinuous in their course than those of trap. One set of veins often intersects another, having been produced at a later period; and the two sets generally differ in color, grain, and even

mineral composition. Granite generally assumes a fine grain, and is even different in composition in the veins it sends into the adjoining rocks. Mineral veins are filled with different kinds of crystalline minerals. Quartz and calcite are the most common of these substances; but frequently several different minerals occur in the same vein, some of these being metallic ores. Veins of the same age are filled with the same metals, and generally maintain a general parallelism of direction. Thus, the tin and copper veins of Cornwall run nearly e. and w.; while the lead veins run n. and south. Three kinds of veins are distinguished by the miners—rake, pipe, and flat veins. The rake veins are simple crevices, crossing all the rocks of a series, generally highly inclined, and apparently formed from the contraction of the rock. The two originally opposite surfaces may retain their relative positions, only separated by the interposed contents of the veins; or a fault may place the originally contiguous surfaces at different levels; and in such a case, the intervening spaces between the walls of the vein are irregular, sometimes narrowing so that the walls are in contact, and then widening out, and forming large cavities containing ores. The pipe veins are irregular cavities, filled with minerals, and without any apparent connection with faults in the strata. Flat veins have a general direction corresponding with that of the stratification, and are connected sometimes with rake veins, and sometimes with pipe veins. The manner of working the minerals contained in veins is explained in the article *Mining* (q.v.).

VEIT, PHILIPP, a distinguished German painter, was born at Berlin, Feb. 13, 1793. His mother, a daughter of Moses Mendelssohn, had for her second husband, Friedrich Schlegel, and Veit became devotedly attached to the religious and artistic ideas of his stepfather, whom he followed in his renunciation of Protestantism for Roman Catholicism. After finishing his studies at Dresden, he proceeded to Rome in 1815, and became a very prominent member of that coterie of young German painters who sought to infuse into modern art the purity and earnestness of mediæval times. Of all the associates, Veit ventured furthest into the obscure realms of symbolism and allegory. His first famous work was the "Seven Years of Plenty," executed as a companion-piece to Overbeck's "Seven Years of Dearth," and forming part of a series of frescoes illustrative of the history of Joseph, painted at the Villa Bartholdy in Rome. In richness and freshness of invention, it is reckoned one of the best works of the school to which it belongs. Other pictures of a high order of merit, done during his residence at Rome, are "The Triumph of Religion" (Vatican gallery), "Scenes from Dante's *Paradiso*" (Massimi Villa), and an altar-piece, representing "Mary as Queen of Heaven" in the *Trinità de' Monti*. These procured him so great a reputation that he was called to the directorship of the Städelsche art institute, in Frankfurt-on-the-Maine. While holding this position, he produced many grand pictures, of which the most celebrated is the large fresco (at the institute), representing "Christianity bringing the Fine Arts to Germany," held by many to be the finest fresco by any modern artist. Others are, "The Two Mariæ at the Sepulchre," and "St. George." In 1843 he resigned his post as director, and removed to Sachsenhausen, in Hesse-Cassel. Among his later works are, "The Ascension of the Virgin," "The Good Samaritan," "The Egyptian Darkness," and "Glorification of the Christian Faith in its Alliance with the Reigning House of Prussia," for the king of Prussia. In 1868 he painted several frescoes for the Mayence cathedral. He died, December, 1877.

VELA, VINCENTO, b. Switzerland, 1822; in youth a stone-cutter; in 1836 studied drawing and worked in studios at Milan. He afterward spent some time in Rome and Venice and settled in Turin, 1849. He has produced a number of statues and bas-reliefs; among which are "Spartacus;" "Harmony in Tears;" "France and Italy;" "Columbus and America;" and "Napoleon in St. Helena;" the last two now in possession of the Metropolitan art museum, New York.

VELASQUEZ, DIEGO RODRIGUEZ DE SILVA, one of the most famous of Spanish painters, was b. at Seville, in June, 1599, of a family of Portuguese origin. Very early, the bent of nature became obvious in him; and he was sent to be educated in the studio of Francisco Herrera el Viejo, an artist of considerable force and originality. He afterward became the pupil of Francisco Pacheco, a man accomplished in theory, but who could practically teach him little. The old pedant had, however, an attractive daughter, named Juana, who, doubtless, to the eyes of the young painter, atoned for her parent's deficiencies, and who married him at the end of 5 years. His chief education, however, as with all men of real genius, was that which he gave himself; he painted assiduously from the life; the models he selected were, for the most part, of the sordid peasant class, and in this way a certain habit of mind was induced, unfavorable to the attainment of that pure and elevated ideal, some infusion of which is all that is wanted to elevate the noble realistic hardihood of his manner into the very highest region of the art. In 1622, he paid a visit to Madrid, to study the treasures of art there accumulated. During his stay, he painted the portrait of the poet Góngora, and made some influential friends, at whose instance he was, the year after, invited to return by the conde, Duque de Olivarez, the favorite of Philip IV. His portrait of this magnate so delighted the king, that he himself sat to the artist, and the result was a picture of superb merit by the public exhibition of which the artist at once became famous. The office of court-painter was bestowed upon him, and he found himself at once embarked on a full tide of the prosperity which continued through life to flow upon him. Of Philip IV. and his fam-

ily he painted many pictures; and shortly after his appointment, he executed a portrait—unfortunately lost—of our own Charles I., then (1623) at Madrid on his famous fool's errand. The year 1628 was made memorable to him by the arrival, in Madrid, of the great Rubens, on a diplomatic mission. The two artists were worthy to become friends, and speedily became so; but though Rubens, during his stay, was assiduous in the practice of his art, the familiarity of Velasquez with his florid harmonies of color and riot of animal vigor, seems to have exercised no modifying influence on the restrained gravity and severity of his own style, now thoroughly matured.

Velasquez had long desired to visit Italy; and in 1629, permission was granted him to proceed thither. Everywhere he was received with the highest honors; and in Rome, in particular, Pope Urban VIII. assigned him apartments in the Vatican. Here he chiefly employed himself in copying the frescoes of Raphael and Michael Angelo; and it is remarkable that, in the one or two original pictures which he at this time produced, no hint of an influence can be traced from his studies of these mighty masters. He was not the less profoundly sensible of their power; though he has left it on express record, that of all the Italians he considered Titian the greatest. Such, however, was his powerful individuality, that his own style once formed, no such external influence was able to affect it appreciably. Having recovered from a severe illness, he proceeded to Naples; and finally, in the spring of 1631, returned to Madrid, where he was cordially welcomed by his royal patron, with whom he now became more and more a favorite. He had a painting-room in the palace assigned him; and the king was wont to come familiarly to watch him at work. It is a noble trait in the man, which deserves to be recorded along with his triumphs as an artist, that when, in 1643, the Duque de Olivarez, to whom he had been indebted while yet obscure, incurred disgrace at the hands of Philip, he braved the royal displeasure, by continuing to show him in everything the respect to which he had been accustomed. In 1648 Velasquez proceeded again to Italy, on a mission from the king to buy pictures and other works of art. He returned to Madrid in 1651; after which time many of his finest works were painted. Such was the favor in which he continued to be held by Philip, that, in 1656, the cross of Santiago was conferred on him, an honor never before awarded except to the highest of the nobility; and shortly after, he was appointed aposentador mayor. This post, the duties of which consisted in attendance on the king in his journeys, and superintendence of everything essential to his convenience, was one of much honor and emolument; but it involved at times great trouble and anxiety; and on the specially important occasion of the conferences held, in 1660, to arrange the marriage between Louis XIV. and the Infanta, these were such as to utterly prostrate the painter. On July 31 of that year, he returned to Madrid, worn down with the overwork to which he had been forced to subject himself, and died in a week after, on Aug. 7. He was buried with much ceremony in the church of San Juan. His wife, who was passionately attached to him, only survived his loss about a fortnight.

Velasquez—with the doubtful exception of Murillo—takes admitted rank as the greatest of Spanish painters. His portraits are, for force, penetration, directness, and severity of truth, of almost unrivaled merit; his historical pictures are also of rare value; his landscape effects are full of air and light; and his treatment of religious subjects only fails in defect of that deeper spirituality, the expression of which has been in its fulness attained by none save a few of the earlier Italians. The works of Velasquez are in this country rare. The two or three specimens to be found in our national gallery very inadequately represent his genius, of the power and variety of which a worthy conception is only to be formed at Madrid, where his finest works are preserved.

VELEZ-MALAGA, a t. in the s. of Spain, in the modern province of Malaga, and 16 m. e. of the city of that name. It stands at the foot of a hill which forms part of the south range of the Sierra Tejada, and rises with its fortress and its spires overlooking the river Velez, at a distance of less than two miles from the shore of the Mediterranean. The climate, said by the Andalusians to be "that of heaven," is delightful; and owing to the abundance of moisture supplied by the hill-streams from the north, and the heat of an almost tropical sun, the vegetation of the vicinity is of the most luxuriant description. The aloe, palm, sugar-cane, prickly pear, orange, vine, olive, indigo, and sweet potato (*Batata de Malaga*), grow here abundantly. There are here the ruins of a Moorish castle, with a small tower. The town was taken from the Moors by Ferdinand the Catholic, after a long siege. Pop. 15,000.

VELIKI-LOUKI, a t. of Great Russia, in the government of Pskov, on the river Lovat, 130 m. n.w. of Smolensk. It is one of the most ancient towns of Russia, having belonged to Novgorod before the annexation of that territory to Moscow. Boots are largely manufactured, and exported to St. Petersburg. Pop. '67, 5,639.

VELIKI-USTIUG, or **USTIUG-VELIKI**, a trading-t. of Great Russia, in the government of Vologda, at the confluence of the Jug and the Suchona, 350 m. s.e. of Archangel. It was founded in the 13th c. by a colony from Novgorod. Among the branches of industry are the manufacture of small iron-ware and of linen. Pop. '67, 7,722.

VELINO. CATARACT OF. See **TERNI**.

VELLEIA, or **VELEIA**, a t. of ancient Liguria, situated among the northern slopes of the Apennines, 18 m. s. by e. of Placentia (Piacenza). Little information respecting

it can be gleaned from the Latin writers. The Veleiates are mentioned by Pliny among the Ligurian tribes, and seem to have been subjected to Rome in 158 B.C. The t., however, dates from the time of Tiberius, and appears, according to the traditional account, to have been overwhelmed by a land-slip of the mountains Moria and Rovinazzo, the earth having been loosened by the percolation through it of the waters from a lake high up in the mountains. A comparison of the soil which covers the city with that of the mountains, confirms this story, though, strange to say, there is not the slightest notice in Roman history of such an event having happened. Velleia remained hid and forgotten till 1747, when a field-laborer turned up a tablet of bronze, on which Trajan's alimentary law for the public maintenance of 279 children was written. This tablet, which measured about 8 ft. 8 in. by 5 ft. 9 in., Paris measurement, and weighed 7,200 ounces, narrowly escaped being melted down for bell-metal; and in 1760 excavations were commenced by the directions of the duke of Parma at the place where the tablet had been found. The result of these investigations, which were continued till 1765, was the discovery of a forum, in which was another bronze tablet of a smaller size than the one previously found, an amphitheater, baths, 12 marble statues, numerous small bronze statues, medals, coins, stamps, inscriptions, and bronze instruments of various kinds. From none of the coins discovered being of later date than the time of Probus, it has been supposed that the catastrophe which overwhelmed the city happened either during or soon after his reign. The museum at Parma contains most of the antiquities which have thus been rescued from the bowels of the earth.

For about a century previous to 1747, it was known to a very few that ancient treasures were concealed at the place where the town was subsequently discovered; and so much wealth in coins and gold statues was discovered by a poor priest belonging to the adjoining village of Macinisso, that his family became ennobled.

A few trifling excavations have been made since 1765, but they have now been discontinued for a number of years.—See *La Rovina di Velleia, misurate e disegnate da Giovanni Antolini*, etc. (Milano, 1819); and *Tavola Legislativa della Gallia Cisalpina ritrovata in Velleia da D. Pietro di Lama* (Parma, 1820).

VELLETRI, a city of southern Italy, in the province of Rome, is walled, well built, and situated on a hill, 21 m. S.E. of Rome. The principal buildings are the cathedral, an ancient Gothic structure; and the Ginetti palace, with a marble staircase, esteemed the finest in Italy. The hill of Velletri, which, like the surface of all the county between it and Rome, exhibits evidences of volcanic action, produces good wines. Pop. 14,800.

VELLORE, a t. and fort of British India, presidency of Madras, in the district of Arcot, 79 m. W. of Madras, on the right bank of the Palar. The fort is extensive, is surrounded by a ditch cut in solid rock, and contains barracks, hospitals, etc. The t. is large, clean, and airy, and has an extensive and well-supplied bazaar. The t. contains a most remarkable and splendid pagoda, dedicated to Krishna, whose adventures with the *gopis*, or milkmaids, are represented in a series of elaborate sculptures. Although the heat of Vellore is great, it is considered one of the healthiest stations in the Carnatic. Vellore was the residence of Tippe Saib's family from 1799 to 1806, when they were removed on account of a sepoy mutiny, which resulted in a terrible massacre of Europeans. Pop. 38,022.

VELLOZIA, a genus of plants of the natural order *hamodoraceæ*, natives of Brazil, southern Guiana, and the Mascarene islands. They are sometimes called *tree lilies*. They are perennials, with trunks closely covered by the withered remains of leaves, branching by forks, and bearing tufts of long, narrow, aloe-like leaves at the extremities of the branches. Some of them are from 2 to 10 ft. high, and the trunk is sometimes as thick as a man's body. The structure of the trunk is very remarkable. It has a slender sub-cylindrical central column, of the ordinary monocotyledonous structure, outside of which are arranged great quantities of slender fibrous roots, which cohere firmly by their own cellular surface and form a spurious kind of wood. In some of the southern districts of Brazil, vellozias are found covering large tracts. The flowers of the larger species are about 6 in. long, either pure white, or of a beautiful purple color, much resembling the white lily of our gardens.

VELLUM. See PARCHMENT.

VELOCIPEDE, a vehicle, consisting of two wheels placed one before the other, and connected by a frame-work, affording a seat for the rider, by whom the vehicle is propelled by means of pedals working a crank attached to the forward wheel. The first known velocipede was invented in 1817 by M. Drais of France, propelled by striking the ground with the feet. In the more modern vehicle the equilibrium is maintained by the momentum in a certain plane, and by the motion of the rider's body and limbs. About 1867, greatly improved forms of the velocipede were introduced, and the exercise became very popular. Among the feats performed were the riding of 100 m. in 7 hours and 43 minutes by David Stanton, and of 132 m. in 12 hours and 15 minutes by J. T. Johnson. Within a few years the velocipede in its old form has given way to the bicycle and tricycle. See BICYCLE.

VELOCITY (Lat. *velox*, swift) is the common term employed to denote speed, or *rate of motion*. It is obviously greater the greater the space passed over in a given time.

But, for its accurate measurement, we must distinguish between uniform and varying velocity.

Nothing is easier than the measurement of uniform velocity. It is measured by the *space passed over in a unit of time*. Thus, we speak of velocities of 10 ft. per second, 20 m. per hour, etc. But, for scientific purposes, it is best to keep, as far as possible, to definite units of time and space; and those most generally convenient are the *second* and the *foot*. The latter is defined, from the imperial yard, by act of parliament: the former is usually chosen as the interval between the beats of a good mean-time clock. Unfortunately, its duration is not invariable; but, as ages must elapse before any sensible alteration takes place in its length, it may be used without inconvenience. If, then, v be the velocity of a point moving uniformly, we mean that v feet are passed over in each second, so that, if s represent the space passed over in t seconds, we have $s = vt$, a formula which contains the whole properties of uniform motion. It gives $v = \frac{s}{t}$; that is,

to find the velocity of a moving point (when uniform), divide the space (in feet) described in *any* period of time by the number of seconds in the period. This will give the same result whether we take a million seconds or the millionth part of a second, as the period in question. This at once shows us how to proceed in measuring a variable velocity, such as that of a stone let fall, in which case the velocity constantly increases, or of a stone thrown upward, in which case the velocity constantly diminishes.

That a moving body has at every instant, however irregular its motion may be, a definite velocity, is obvious, and is in fact matter of every-day remark. Thus when traveling in a railway train we say, shortly after starting: "We are now going at the rate of a mile an hour;" not thereby meaning that it will take us an hour to complete the mile, but that *if we were to go on for an hour with the velocity we now have we should run a mile*. Again we may say: "Now we are going at 30 m. an hour;" not thereby meaning that we have so much as 30 m. to travel, or that our journey is to last more than perhaps a few minutes, but that *an hour at the present rate would take us 30 miles*. In common language, then, our question is how to measure our present rate.

If we could at any instant so adjust the steam-power to the resistance of the air and the friction of the rails as to keep the rate unaltered, we should have uniform velocity, measurable with ease, as above shown. But as we cannot generally do this (though Attwood's machine enables us to in the case of a falling body), we are driven to some other expedient. Now it is obvious that the smaller the interval we take the less will our velocity have changed during its lapse, i.e., the more nearly will it have become uniform and measurable by the simple formula given above. That is for a variable velocity we have $v = \frac{t}{s}$ as an approximation, which is more and more nearly true as t ,

and therefore s , is smaller. In the language of the differential calculus—whose fundamental notions as laid down by its great inventor were in fact derived from this very question, the velocity being simply the *fluxion* (q.v.) of the space described—we have

$v = \frac{ds}{dt}$. Practically, by means of the electric chronoscope, we can now measure (very exactly) extremely small intervals of time, such, for instance, as the interval between the fall of the dog-head and the exit of the bullet from a rifle-barrel; so that a variable velocity now presents no formidable difficulty, as we can study and measure it *while it is almost absolutely uniform*.

We define *average velocity* as the space described in any time divided by the number of seconds employed. This may not, except at one or more instants during the motion, represent the actual velocity; but it is a velocity with which, if uniform, the same space would have been described in the same time. We shall presently have an opportunity of usefully applying this definition to one interesting case of varying velocity.

The *resolution and composition* of simultaneous velocities follows, almost intuitively, from the most elementary geometrical notions. When a man is walking n.e. at a uniform rate, it is obvious to common sense that he is progressing northward and also eastward. What is his northward, and what is his eastward velocity. The answer is very simple. Suppose that in one second he walks from A to B, then AB represents his whole velocity. But draw AN northward and AE eastward; also draw BC parallel to AN. Then AC is the space by which B is eastward of A, BC the space by which it is northward. Hence AC represents the eastward and CB the northward velocity (each being the space in its respective direction described in one second, and these are called *components* of the velocity AB. AB again is said to be *resolved* into AC and CB.

The general proposition is this, that a velocity represented by one side of a triangle may be resolved into two, represented in magnitude and direction by the other sides of the triangle. One or both of these may be again resolved by a similar process; and we find, as the most general propositions on the subject, that velocities represented by all the sides of a polygon (whether in one plane or not)

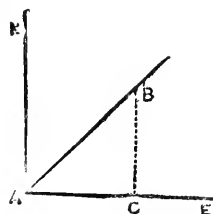


FIG. 1.

but one, taken in the same order round, are jointly equivalent to a velocity represented by that one side, taken in the *opposite* order; also that a point which has simultaneously velocities represented by the successive sides of any polygon, taken all in the same order round, *is at rest*. The second law of motion (see MOTION, LAWS OF) enables us to interpret this geometrical theorem into the physical truths known as the triangle and polygon of forces in statics.

Rate of change of velocity is called *acceleration*. It is measured in the same way as velocity itself. Thus if the change take place in the direction of motion it affects merely the amount, not the direction of the velocity; and an acceleration α adds (or subtracts, if it be negative) α feet per second from the velocity affected. Thus it is found that gravity produces an acceleration of about 32.2 on all falling bodies; so that if a stone be let fall, its velocity after t seconds is $32.2t$. If it be *thrown* down with a velocity v , its velocity in t seconds is $v + 32.2t$. If thrown upward with the same velocity, in t seconds its velocity becomes $v - 32.2t$, so that it will stop and begin to descend after $\frac{v}{32.2}$ seconds have elapsed.

The space passed over by the stone in t seconds is easily calculated by the help of the *average* velocity. For since in any of the above cases the velocity increases (or diminishes) *uniformly*, its average value during any interval is the average of its values at the beginning and end of the interval. Hence for the stone simply let fall:

Initial velocity = 0.

Velocity after t seconds = $32.2t$.

Average velocity during the first t seconds = $16.1t$. Hence, space described in t seconds

$$= t \times \text{average velocity} = 16.1t^2.$$

So that the spaces described are as the *squares* of the times.

But if the acceleration be not in the direction of motion, the direction and magnitude of the velocity will generally change. To exhibit this geometrically, sir W. Rowan Hamilton (q.v.) invented the following beautiful construction of what he called the hodograph of the motion. Let O be any fixed point, and from it draw lines OP, OQ, etc., representing at every instant in direction and magnitude the velocity of the moving point. The extremities of such lines will form a curve, such as PQ in the figure. If OP and OQ be any two of these, the *change* of velocity is represented (as above) by the third side, PQ, of the triangle.

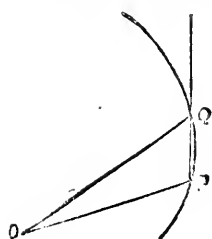


FIG. 2.

As Q is taken nearer and nearer to P, PQ becomes more and more nearly the tangent to the hodograph, so that the tangent at P has the *direction* of the acceleration, and the rate at which P moves round the hodograph is the *magnitude* of the acceleration.

If we consider any uniform motion, we see that the hodograph is a circle (its radius being the magnitude of the velocity), and from this it is easy to see that *in uniform motion the acceleration is always perpendicular to the direction of motion*. If we consider uniform motion, with velocity V, in a circle of radius R, the hodograph at once shows that the acceleration is $\frac{V^2}{R}$, and is directed toward the center of the circle.

Translated into physics, acceleration (multiplied by the mass of the moving body) is the measure of the force which acts on the body. So the above simple example shows that, to keep a mass moving uniformly in a circle, it must be drawn toward the center by a force proportional directly to the square of the velocity, and inversely to the radius. This is the physical explanation of the so-called centrifugal force (see CENTRAL FORCES).

VELOCITY, INITIAL, in gunnery, is the speed with which the ball leaves the muzzle of the gun. This was formerly calculated from the momentum as shown by the ballistic pendulum (q.v.). A great improvement of the last ten years is the electro-ballistic pendulum, the invention of a maj. Navez of the Belgian service, which actually measures the interval of time during which the shot traverses a short space of ground. The apparatus consists of a steel pendulum falling at the side of a graduated sector of a circle. Behind the segment is a piece of iron capable of being magnetized by a galvanic battery adjoining. The wires for completing the circuit between the battery and the magnet are so arranged that they are in connection with two targets of paper or other thin material in the line of the projectile's fire. So long as the circuit is complete, and before the experiment, the magnet holds the pendulum at its highest point. When the shot pierces the first target, the circuit is broken, the iron demagnetized, and the pendulum released; these effects being absolutely simultaneous. With equal simultaneity, the piercing the second target re-establishes the circuit, magnetizes the iron, and arrests the pendulum in its descent. The distance between the targets is known, and the accumulating resistance of the atmosphere within that time; the sector being finely graduated, the distance traversed by the pendulum shows exactly the fraction of a second occupied, and from these data the initial velocity is a matter of simple computation. Of an ordinary smooth-bore cannon, the initial velocity is about 1600 ft. per second.

VELOCITY, VIRTUAL. See **WORK.**

VELPEAU, ALFRED ARMAND LOUIS MARIE, 1795-1867; b. France; studied medicine, and settled in Paris in 1821. In 1830 he was appointed surgeon to the Pitié hospital; in 1835 professor of clinical medicine at the academy of medicine, and in 1842 was called to the same position at the institute. Among his works are: *Traité de l'Anatomie Chirurgicale* (1825); and *Nouveaux Eléments de Médecine Opératoire* (1832).

VELVET, a fabric in which, besides the ordinary warp and weft, which are usually arranged as in twill-weaving, there is also a supplementary weft, consisting of short pieces of silk, cotton, or woollen thread doubled under the regular weft, and brought to the surface in loops which are so close together as to conceal the regular web. The loops are afterward cut evenly, and the ends thus made constitute a covering resembling a very short fur. In silk velvets, the warp and pile threads are both of organzine silk, which is the strongest used in weaving.

VENANGO, a co. in n.w. Pennsylvania, drained by the Alleghany and French rivers: 620 sq.m.; pop. '80, 45,670—39,675 of American birth, 548 colored. Co. seat, Franklin.

VENDACE, *Coregonus Willughbii* or *maranula*: see **COREGONUS**, a fish of the family salmonidæ, found in the rivers and lakes of Sweden, in the castle loch at Lochmaben in Scotland, and in some of the English lakes. It is popularly said to have been introduced at Lochmaben by queen Mary; but the statement rests on no authority, and is highly improbable, as the fish could not be easily transported, except by the roe, living only for a very short time after being taken out of the water. Like most of its congeners, it is highly esteemed for the table. Its food consists chiefly of *entomostraca*, and it is never taken by angling. Sweep-nets are used for its capture. It generally swims in considerable shoals, often with a remarkable separation of the sexes. It attains a length of 6 or 7 in., is deeper in proportion than many of the salmonidæ, and of a compressed form. The outline rises quickly from the snout to the dorsal fin, and the body tapers rather suddenly at the tail. The under-jaw projects a little. The scales are of moderate size, and do not come off very readily. The tail is broadly forked. The back is brown, the sides tinged with yellow, the cheeks partly white, and there is a curious red, heart-shaped mark between the eyes. It spawns in November and December, and multiplies rapidly, notwithstanding the presence of predaceous fishes in the waters which it inhabits. Vendace fishing at Lochmaben takes place only on Aug. 1, each year. The vendace might probably be introduced with advantage into many of the British lakes. It is doubtful if this fish is the same with *coregonus albus*, found in Pomerania.

VENDEE, LA, a maritime department in the west of France, bounded on the w. by the bay of Biscay, on the n. by the department of Loire-Inférieure, and on the s. by that of Charente-Inférieure. Area, 2,587 sq.m.; pop. '76, 411,781. The department, which owes its name to a small affluent of the Charente, is traversed from e. to w. by a range of hills, called in the e. the Plateau de Gatin, and in the w. the Collines Nantaises; and is watered in the n. by the affluents of the Loire, and in the s. by the Lay and the affluents of the Charente. The territory of La Vendee is divided into three parts, the names of which indicate the character of their configuration. In the w. is the *Marais*, occupied by salt marshes and lakes; in the n. is the *Bocage*, covered with plantations; in the s. and middle is the *Plaine*, an open and fertile tract. The coast-line, 93 m. in length, presents few deep indentations, the chief being the bay of Aiguillon, which affords secure anchorage for vessels. The climate is warm, humid, and unhealthy in the *Marais*, cold and humid in the *Bocage*, and warm, dry, and healthy in the *Plaine*. Cereals, potatoes, and vegetables are largely cultivated; the wine produced, which is white and of inferior quality, amounts to 5,500,000 gallons a year. Among the mineral treasures iron ore is very abundant. There are three arrondissements—La Roche-sur-Yon, Fontenay-le-Comte, and Sables-d'Olonne. The capital is La Roche-sur-Yon.—For the wars of La Vendee (by which name the armed opposition to the religious and political changes in France is denoted, and which burst out into a species of partisan warfare in 1793, 1794, 1795, 1799, and 1815), see CATHELINÉAU, LAROCHEJACQUELIN, HOCHÉ, CHOFANS, etc.

VENDEMAIRE (i.e., the "wine-month"), embraced, in the calendar of the first French republic, the period from Sept. 23, to Oct. 21. Particularly memorable in the history of the revolution is the 13th Vendémiaire of the year IV. (Oct. 5, 1795), when the Paris "sections" worked upon by royalist reactionaries in all sorts of ways, rose against the national convention, but were decisively beaten by a military force under the command of Barras, or rather of his lieutenant, Napoleon Bonaparte, then a young officer only beginning to be known. The victory of the convention saved the republic—for a time.

VENDET TA, (vengeance), the term used to denote the practice, as it prevails in Corsica, of individuals taking private vengeance upon those who have shed the blood of their relations. In Corsica, when a murder has been committed, the murderer is pursued not only by the officers of justice whose duty it is to punish offenses against society, but also by the relatives of the slain, upon whom the received views of social duty impose the obligation of personally revenging his death. In such a case, the relatives

of the murdered man take up their arms, and hasten to pursue, and if they can find him, to slay the murderer. If he succeed in eluding their pursuit, the murder may be revenged upon his relatives; and as the vengeance may be taken whenever an opportunity occurs, the relatives of a murderer whose crime is unavenged have to live in a state of incessant precaution. When they go to the fields they take their arms with them, and set a watch; at home they have their doors well fastened, and their windows barricaded; and since the avenger is never far distant, they live, in fact, in a state of siege. Instances are on record of persons who were, as the phrase is, "suffering the vendetta," having lived shut up in their houses for 10 or 15 years, and being, after all, shot on the first occasion on which they ventured out of doors. Formerly, when blood had been shed, there was a custom of proclaiming the war of revenge, and announcing to what degree of relationship it should extend; but this custom is gone out of use. Frequently, in the practice of this system of vengeance, each of two sets of relatives has a murder to revenge upon the other; the vendetta, that is, *crosse*. This is called the *vendetta trans-versale*. The duty of taking vengeance lies primarily and especially upon the next of kin. Not to take revenge is deemed in the highest degree dishonorable; and any delay in doing so on the part of the next of kin is made matter of reproach by his relatives. When the Genoese were masters of the island, their laws declared the *rimbizzo*—the uttering of such reproaches—punishable, as an incitement to murder. But there is seldom occasion for the *rimbizzo*, for the Corsican is brought up to regard the vendetta as the most sacred duty of man. The women instigate the men to revenge by singing songs of vengeance over the body of the slain, and displaying his blood-stained garments. Often a mother affixes to her son's dress a bloody shred from the dead man's shirt, that he may have a constant reminder of the duty of taking vengeance. Although the vendetta usually has its origin in bloodshed, smaller injuries may give rise to it, and even purely casual occurrences. Mediators, termed *parolanti*, often interpose to make up a quarrel. When they succeed, an oath of reconciliation is taken, and this oath is regarded as specially binding. It is infamous to break it; nevertheless, it is broken now and then. Brigandage prevails to a great extent in Corsica, and the origin of the career of a brigand, in almost every instance, can be traced to the vendetta. A man commits a murder out of vengeance; he flees to the hills; it never is safe for him to resume his former life again, and so he turns robber for a living. Besides the vendetta, properly so called, hereditary family feuds are very common in Corsica; and sometimes there are hereditary feuds between whole villages. The great families of the island hand down feuds from generation to generation, in which not only themselves and all their relatives, but all their servants and dependents are involved—the kind of feud which was common in the Italian towns of the middle ages, and which is illustrated in the play of *Romeo and Juliet*.

The origin of the vendetta has often been referred to the lawlessness which prevailed in many parts of Corsica during the period of the Genoese domination, and to the venality which vitiated the Genoese administration of justice. And, no doubt, the insecurity and the mal-administration of justice which existed in Corsica for ages, helped to consolidate this barbarous custom; which, thus consolidated, has been perpetuated by the isolated position of the country, and the absence of civilizing influences. But the explanation of its origin must be sought in more general causes, for it is not exclusively a Corsican custom. On the contrary, it may be safely affirmed that a system of private vengeance, almost precisely similar, has existed among every people during certain stages of its progress—never entirely passing away until government became strong enough to insure redress of injuries, and to restrain the passions of individuals.

In the case of rude tribes, in the savage or semi-savage state, there is on record such a multitude of instances of the existence of the blood-feud, that its universality among men in that state cannot be doubted. Its incidents are usually the same which sir G. Grey found subsisting among the aborigines of Australia, and of which, in his *Journals of Travel in the North-west of Australia*, he has given a vivid description. The Australian tribe usually includes several stocks or bodies of men, between whom blood-relationship is acknowledged; and every member of a stock is bound to assist in taking vengeance for a personal injury done to any of his kinsmen. On the other hand, though a hunt is always made for the actual wrong-doer, the injury may be satisfactorily avenged upon any member of his stock. As in the Australian and similar tribes, there is no relationship acknowledged between members of the same family unless they are also members of the same stock (see article *TRIBE*), the blood-feud occasionally arrays father against son, and brother against brother. It often leads to the break-up of a tribe.

Of the prevalence of the blood-feud among tribes which have advanced to what is called the patriarchal state also, there is very ample evidence. Among such tribes, the cohesion of the family is very powerful; everything relating to the family is quasi-sacred; and the duty of taking vengeance for kindred blood is not merely a matter of honor, but of religion. Volney's description of the blood-feud, as practiced among the Bedouins, will do for all the tribes of this class; and it might almost stand for a description of the vendetta. "The interest of the common safety," he says, "has for ages established a law among them (the Bedouins) which decrees that the blood of every man who is slain must be avenged by that of his murderer. This vengeance is called *tar*, or

retaliation; and the right of exacting it devolves upon the nearest of kin to the deceased. So nice are the Arabs upon this point of honor, that if any one neglects to seek his retaliation, he is disgraced forever. He therefore watches every opportunity of revenge; if his enemy perishes from any other cause, still he is not satisfied. His vengeance is directed against the nearest relation. "These animosities are transmitted as an inheritance from father to children, and never cease but by the extinction of one of the families, unless they agree to sacrifice the criminal, or purchase the blood for a stated price in money or in flocks. Without this satisfaction, there is neither peace, nor truce, nor alliance between them, nor sometimes even between whole tribes." The blood-feud is observed almost precisely as described above, among the Circassians, the Druses, and the numerous hordes of central Asia; it seems to have had the same incidents, too, among similar tribes in ancient times—e.g., among the Greeks of the Homeric period, among the Germans in the time of Tacitus, among the northern nations who overran Europe after the fall of the Roman empire. The Corsican vendetta seems to be the same thing as the Bedouin tar, surviving, with slight modifications, in a secluded island, where the law has never made itself supreme, long ages after the progress of society and the consolidation of government have effaced every trace of it, except at a few isolated points on the neighboring continent of Europe. The vendetta exists in Sicily and in Sardinia, as well as in Corsica; in Calabria also; and it (or we should rather say, the blood-feud) flourishes vigorously among the Montenegrins and the Albanians.

The right of private war which subsisted in Europe in the middle ages—introduced by the northern nations who shared the spoils of the Roman empire—was just a modification of the blood-feud. This right belonged only to the nobility, and could be exercised only against men of equal rank. It was usually resorted to on account of insults publicly done, of atrocious acts of violence or bloodshed, and similar injuries. The right of vengeance devolved first upon the next of kin; but all the kindred within the degrees of relationship to which the ecclesiastical prohibitions of marriage extended, were bound to take up the quarrel; and this obligation was so far sanctioned by law, that if any one failed to fulfill it, he was deemed to have renounced his kindredship, and to have lost his rights of succession. Vassals, equally with kinsmen, became implicated in the vengeance of their lords; and every person present when the cause of quarrel arose was required to take side with one or other of the parties. For several centuries, private wars were constantly being waged within the kingdoms of the continent, and the efforts of kings and ecclesiastics to restrain them produced little effect until governments became strong enough to prohibit them, and to enforce the prohibition.

It is now apparent that the vendetta represents a system which prevailed everywhere before the consolidation of society into the state, and the establishment of a police capable of protecting life and property. This system was a rude substitute for government and the administration of justice. The family, or the body of kindred, formed, in fact, a commonwealth of itself; its members held firmly together; and when one was injured, all the little state was injured. The Nagas have no government, and among them the blood-feud is the only check—it is not altogether inefficient—upon the selfishness and the passions of individuals. As society became consolidated, the exercise of this right of vengeance was curtailed—remaining longest with the nobility, who counted it as one of their most valuable privileges, and maintained it as long as possible. They had to surrender it at last, because the state grew strong enough to supersede the action of individuals in redressing injuries, and was able to do this with greater fairness, and without the same admixture of calamitous results.

VENDÔME, a t. of France in the dep. of Loir-et-Cher, seated on vine-clad hills, on the Loir, which here divides itself into many canals, 45 m. w.s.w. of Orleans. It contains cavalry barracks; a theater; the church of the Trinity, a remarkable edifice; one of the most beautiful colleges of France; and the ruins of a lofty castle. Manufactures of cloths, needles, and embroideries are actively carried on. Pop. '76, 7,806.

Vendôme, a very ancient town, and said to have been of importance under the Merovingians, was the capital of the ancient county of Vendomois, which was erected into a duchy-peerage by Francis I., in favor of Charles de Bourbon. Henry IV. conferred it on one of his natural sons, who thus became the founder of the house of Vendôme. In 1870, it was the scene of several conflicts between the French and Germans.

VENDÔME, HOUSE OF. Vendôme was an old county of France, erected into a duchy by Francis I., for behoof of Charles of Bourbon, the grandfather of Henry IV. On the accession of the Bourbons to the throne, it was reunited to the crown, but again separated from it by Henry IV., who conferred it upon Cesar, the eldest of his sons by Gabrielle d'Estrées. Cesar's eldest son, Louis, duke of Vendôme, married Laura Mancini,* one of Mazarin's nieces, and had by her three sons, the eldest of whom was **LOUIS-JOSEPH, DUKE OF VENDÔME**, the celebrated French general who so distinguished himself

* It is curious to remark the relationship between the opposing leaders in the great war of 1700-13. Vendôme (French) and prince Eugene (allied) were cousins; Vendôme was second cousin to the duke of Burgundy; Eugene was similarly related to the duke of Savoy; and Marlborough (allied) and Berwick (French) were uncle and nephew.

during the war of the Spanish succession. He was born at Paris, July 1, 1654, and made his first appearance on the field of battle as a lifeguardsman during the Dutch campaign of 1672, afterward serving with distinction under Turenne in Germany and Alsace, and under Crequi in Flanders. Released by the peace of Nimeguen (1678), he retired to his château of Anet, near Dreux, where he resigned himself to the most liberal indulgence in all kinds of pleasure. At this time he became compromised in the affair of Lavoisin (see POISSONNET); but it turned out that his intercourse with the pretended seer was prompted merely by curiosity. On the outbreak of war in 1688, he was ordered to the low countries, where, under Luxembourg (q.v.), he earned deserved renown at the sieges of Mons and Namur, and the battles of Leuse and Steenkerk; and his high reputation was not diminished by his subsequent conduct in Italy, where he commanded the left wing of Catinat's army at the battle of Marsaglia (Oct. 4, 1693). But Vendôme's brilliant gallantry and military talents had not hitherto succeeded in obtaining for him the honor of an independent command, for it was only too evident that with these valuable qualities were combined inveterate indolence, and careless and disorderly habits, which might, as effectually as the most utter incapacity, ruin the chances of any enterprise under his management. However, the necessities of the case induced Louis ultimately to give him (1695) the command of the army in Catalonia; and he was agreeably surprised at the alertness of Vendôme, who closed a series of brilliant successes by the capture of Barcelona, an exploit which did much to bring about the peace of Ryswick (1697). After five years of inaction, spent in sloth and sensuality, he was dispatched by his sovereign to supersede Villeroy in Italy. His arrival was hailed enthusiastically by the soldiery, who relied implicitly upon his brilliant genius and happy audacity to extricate them from all difficulties, and with whom his excessive laxity in the matter of discipline rendered him a great favorite. The restored confidence of the troops was proved by the victories of Ustiano and San-Vittoria; while the enforced retirement of prince Eugene beyond the Mincio equally showed the superior strategic abilities of their general; and it required the utmost exercise of both to prevent the surprise at Luzzara (Aug. 15, 1702), brought about through Vendôme's usual carelessness, from becoming a total rout. From this time, a slight though temporary improvement in Vendôme's habits is visible; in 1703, he drove the Austrians before him into the Tyrol, repeatedly defeating Starhemberg; when the defection of the duke of Savoy forced him to retreat. The duke, though joined by Starhemberg, was beaten again and again, and at last cooped up in Turin, whither Eugene was advancing to his relief, when the defeat of his advanced guard by Vendôme compelled a halt. The imprudent Frenchman, however, intrusted the difficult duty of holding Eugene in check to his younger brother, the grand-prior, who, though a gallant soldier, was no match for his opponent in generalship; and had not Vendôme returned to Cassano just in time to divide the honors of the battlefield with his opponent, the army of observation would have been scattered to the four winds of heaven. Again, partially stimulated by this narrow escape, Vendôme displayed unwonted vigor, and drove the Austrians into the Trentin; but in the summer of 1706, he was recalled to supersede Villeroy, who had blundered in the low countries, as he had formerly done in Italy. Unfortunately, Vendôme's besetting faults were attempted to be remedied by uniting the duke of Burgundy with him in command; and the want of a thorough understanding between the conjoint chiefs led to the defeat of the French at Oudenarde (q.v.), and to the failure of the attempt to relieve Lille. The cause of these reverses formed the subject of vehement discussions in France, and though undoubtedly Vendôme was mostly to blame, his great reputation gained him the public support; yet Louis XIV. held him in a sort of disgrace for a time. In 1710, a cry of distress arose from Spain, where the British and Austrians were carrying all before them; and in compliance with the urgent request of Philip V. (who had served under Vendôme in Italy) to his grandfather to send him—not a re-enforcement, but only Vendôme, the heroic old debauchee was once more roused up from his lair, and dispatched to Spain. His appearance, like that of Du Guesclin more than three centuries before, brought together as if by magic a numerous army of volunteers; towns, villages, and even religious establishments united in a most enthusiastic manner to contribute the necessary funds, and Philip was settled in his capital before the close of the year. A week after, Stanhope and the British troops were defeated and captured at Brihuega; and on the following day, Starhemberg and the Austrians were completely routed at Villa Viciosa. The grateful monarch raised his deliverer to the rank of a prince of the blood royal, and presented him with 500,000 livres (£20,000), a gift which Vendôme accepted only to distribute it among his soldiers. Vendôme for the last time relapsed into his usual habits, and after "a month of extraordinary gluttony," died of indigestion at Vinaroz in Valencia, June 15, 1712. Vendôme, of all the descendants of Henry IV. both then and since, bears the strongest resemblance to his great-grandfather; but of the resolute persistency and self-denial of the first and greatest of the Bourbon monarchs, we cannot discern in him the slightest trace.—Saint-Simon's biography of Vendôme, and Voltaire's *Siècle de Louis XIV.*, are the principal authorities for the life of this extraordinary man.

Vendôme's disinterestedness, like his other good qualities, and they were not a few, became a vice from its very extravagance. It is related that one of his domestics demanded permission to leave his service on the ground that he could not stand by to

see a master robbed by his servants in such a barefaced way. "Is that the reason?" said Vendôme; "very well, then, rob like the others."

VENDOR'S LIEN, the equitable lien which the vendor of land has for the balance of the purchase money still unpaid. It is enforced, like a mortgage, which it resembles, by foreclosure and sale. It can be enforced against the vendee, and all persons holding under him, except purchasers for value without notice. The vendor loses this lien if he accept a higher security, a mortgage, for instance, or if he take collateral security from a third person; but he does not waive his lien by accepting the personal security of the vendee.

VENEER (Fr. *fournir*, to furnish), a layer of wood, cut very thin, for the purpose of being glued on to the surface of a commoner kind. Only choice kinds of hard woods are sawn into veneers, and they are usually attached to deal or pine, so as to give all the appearance of being made solid. In this way the more costly kinds of furniture-woods are economically used by the cabinetmaker, for with the improvements which have been effected in the process of sawing, veneers as thin as paper have been produced.

VENE' REAL DISEASE. See SYPHILIS.

VENERIDÆ, a family of lamellibranchiate mollusks, having a regular, closed, bivalve shell; the teeth and laminae of the hinge near together in a single group under the beak (*umbo*); generally three diverging teeth in each valve; a marked oval impression in front of the beak; the general form similar to that of the cockles (*cardiacea*), but usually more flattened. The mantle has a large opening in front; the siphons are unequal, more or less united; the foot is tongue-shaped, compressed, sometimes grooved, and producing a byssus (q. v.). The species, all of which belong to the Linnean genus *Venus*, are very numerous. They are very widely distributed, but abound chiefly in tropical seas. About forty are found on the British coasts, some of them very common. The veneridæ are generally elegant in form, and often finely colored. Some of them have the shell furnished with long spines, but chevron-shaped lines are their common ornament. The veneridæ first appear in the oolitic rocks, and are more abundant in the present than in any former geological epoch.

VENESECTIO (occasionally termed **PHLEBOTOMY**, and popularly known as **BLOOD-LETTING** or **BLEEDING**) is an incision into a vein, for the abstraction of blood. Although the operation may be performed on many of the superficial veins, it is restricted in this country to the veins at the bend of the elbow. Of these veins, the most prominent are the median-cephalic and the median-basilic; the former being situated on the outer side of the tendon of the biceps muscle, while the latter lies on the inner side, and only separated from the brachial artery by a thin layer of fascia. Hence, from fear of wounding the artery, the median-cephalic should be preferred; but in reality the median-basilic is usually selected, in consequence of its being the more prominent and larger vein of the two. The appliances required are a lancet, a bleeding-tape or narrow bandage; lint, a bowl to receive the blood, a basin of water, and a sponge. The patient being placed in a sitting position, the tape or bandage must be tied sufficiently tight around the middle of the upper arm, or rather lower, to arrest the venous circulation without materially affecting the pulse at the wrist. The forearm having been allowed to hang down till the veins are tense, the operator must make his selection, and taking the blade of the lancet between the forefinger and thumb of the right hand, should fix the vein by pressing his left thumb upon it just below the part he is about to open. Steadying his hand by resting the ends of the three outer fingers on the forearm, he should steadily (and without a jerk or plunge) introduce the point of the lancet obliquely until the interior of the vessel is reached, and the blood is seen rising up. Without penetrating deeper, he should thrust the instrument forward, so as to open the vein longitudinally to a sufficient extent. On now removing the thumb, the blood should emerge in a full jet; and if the stream be scanty, the patient may have a hard body—as a piece of stick or a pocket-knife—placed in his hand, with directions to grasp it firmly, or the surgeon may increase the flow by chafing the palmar surface of the forearm, rubbing from below upward. When a sufficient quantity of blood has been abstracted, the thumb of the left hand should be placed on the wound, and the ligament loosened; a small pad of lint should then be placed over the orifice, the surrounding parts should be cleaned of blood by a sponge, and the pad of lint compressed against the arm by the tape or narrow bandage, applied in the figure-of-eight form, with the crossing of the tape lying on the pad. After the operation the arm should be carried in a sling for a day or two. We have, contrary to our ordinary custom, given the details of the operation, because it is one which, if performed at the proper moment, may be the means of preserving life, and which any person of ordinary intelligence could probably perform more safely, after reading these directions, than the farriers, barbers, etc., who are frequently called upon to perform it in remote country districts and in the backwoods of our colonies. Among the occasional ill consequences of venesection may be mentioned: (1) The escape of blood into the surrounding cellular (or connective) tissue, giving rise to a swelling called *Thrombus*, which, if it does not rapidly become absorbed, should be emptied by the lancet. This is due to a want of coincidence between the wound in the integument and in the coats of the vein. (2) Phlebitis, which generally arises from the use of an unclean

lancet. Varicose aneurism and (4) aneurismal varix, both of which may be included under the term arterio-venous aneurism, since in each case there is an aneurismal dilatation of an artery communicating with a vein; while they differ in this respect, that varicose aneurism is said to exist when an artery has been punctured through a vein (in this case, the brachial artery through the median-basilic vein), and a false or traumatic aneurism, composed of lymph that was effused between the vessels, has formed between them, and opens into both; while aneurismal varix is similarly produced, but the two vessels adhere together, the communication between them remaining permanent. These diseases often have such a tendency to remain stationary that no interference is necessary; occasionally, however, very serious surgical treatment is required, for details of which we may refer to that excellent article on "Aneurism," in Holmes's *System of Surgery*.

In children, and occasionally in others, where the veins of the arm are small and undefined, blood is drawn from the external jugular veins. As this operation would only be performed by a surgeon, it is unnecessary to describe it; and we will merely remark, that as the entrance of air into the vein during the operation, or until the orifice of the vein has been closed, would cause instant death^{*}, this vein should only be opened in extreme cases.

We have no space to notice at any length the general results of bleeding, or the much disputed question, whether venesection should not be discarded from our list of operations,† because no rational doubt can be entertained that, although, until a quarter of a century ago, or later, there was a most unnecessary and probably hurtful effusion of blood, venesection, in properly selected cases, is one of the most valuable remedies. A patient can bear a much greater loss of blood in the horizontal position than when sitting, and in that position than when standing. The condition required to be produced is that there should be ineipient faintness; and the loss required to produce this effect varies extremely in different individuals and in different diseases. The late Dr. Marshall Hall, in his work on *The Effects of the Loss of Blood*, states that the average loss of blood required to produce slight faintness in a healthy person in the sitting position is 15 ounces. In some diseases, more, and in others less, than this loss can be borne. The greatest loss can be borne in congestion of the head, or tendency to apoplexy (from 50 to 40 ounces); then in inflammation of the serous membranes and of the parenchymatous substance of various organs (from 40 to 30 ounces); then acute anasarca (about 20 ounces); and then inflammation of the mucous membranes (about 16 ounces); while the system bears less than the quantity borne in health, in the eruptive and other fevers, in delirium tremens, dyspepsia, and chlorosis—a set of diseases in which blood-letting is now scarcely ever resorted to.

VENETIA. See VENICE, *ante*.

VE NETIAN CHALK, a variety of soapstone or steatite, used sometimes in the manufacture of drawing-crayons.

VENETIAN STYLE of architecture. This term is applied to the particular phase of the renaissance developed in Venice. Under the head ITALIAN ARCHITECTURE, the peculiarities of the various schools of Italian architecture are pointed out. The Venetian is the most picturesque and ornate, as compared with the styles of Rome and Florence. "Venetian-Gothic" indicates the peculiar phase of that style so common in Venice and the north of Italy, and chiefly applied to domestic architecture. See GOTHIC ARCHITECTURE.

VENEZUE'LA, a republic in the n.w. of South America, bounded on the n. by the Caribbean sea, on the w. by the United States of Colombia (New Grenada), on the s. by Brazil, and on the e. by British Guiana. Lat. 1° 20' to 12° 25' n.; long. 59° 45' to 73° 17' west. Within recent years the country has been variously subdivided. In 1854 there were 18 provinces—those of Apure, Barcelona, Varinas, Barquisimeto, Carabobo, Caracas, Coro, Cumana, Guiana, Maracaybo, Margarita, Merida, and Truxillo—with an aggregate population of 945,408. Subsequently, the number of provinces was increased to 21, by subdividing 8 of the original provinces. In 1863, after the federals had conquered the unionists, a confederation was formed, and the number of *states* was reduced to 7. The present distribution is into 20 states, a federal district, and 3 territories. The area of the country is estimated to embrace 401,700 sq. m.; and the population in 1873 was 1,784,194. The capital is Caracas, or more correctly Caracas (q.v.). The coast-line, extending from e. to w.,—from the delta of the Orinoco to the boundary of the United States of Colombia—is 1584 m. in length. The most easterly part of the coast-line, 150 m. in length, and formed mostly by the delta, is washed by the Atlantic, and is very low. The waters of the gulf of Paria beat upon bold and rocky shores. The remainder of the coast-line, including the north shore of the peninsula of Paria, is

* Few deaths are more rapid than those caused by the entrance of air into the veins of the neck. Many surgical operations in that region have proved fatal from this cause; and the knowledge of this fact has been applied to the slaughtering of horses, oxen, etc. It is probably one of the most humane forms of destroying life.

† On this subject, the non-professional reader may consult a long foot-note to Dr. (now Sir Thomas) Watson's *Lectures on the Principles and Practice of Physic*, 4th ed., vol. i., pp. 231-4; and Dr. Markham's *Lectures on the Change of Type in Disease; with a Letter by Sir Thomas Watson*, 1866.

washed by the Caribbean sea, and the coast, for the most part low and marshy, is sometimes precipitous, the mountains rising like a wall from the water's edge. With trifling exceptions, the country is abundantly watered. Its great river is the Orinoco, which drains by far the greatest part of it, and the course of which is almost wholly within its boundaries. The other greater rivers of Venezuela are affluents of the Orinoco (q.v.). Numerous streams, small in comparison with the great rivers, flow n. into the Caribbean sea and the lake of Maracaybo (q.v.), which is by far the largest lake in the country. The Andes enter Venezuela from the w., and divide into two branches, the first of which runs n. toward the coast, under the names of the Sierra de Perija and the Montes de Oca, but rise no higher than 4,200 ft.; while the other branch, running in a n.e. direction, terminates near the coast, in long. $68^{\circ} 30'$ w., and attains a much greater elevation. That part of the n.e. branch of the Andes called the Sierra Nevada de Merida, and situated about 100 m. s. of lake Maracaybo, contains the only mountain that rises above the line of perpetual snow, and the two peaks of which are 15,342 and 15,310 ft. high respectively, the loftiest in the country. South and s.e. of the Orinoco are the most mountainous districts of Venezuela. They form a vast, confused, and mostly unexplored region, but none of these mountains rise to the height of the main peaks of the Andes. The country embraces vast table-lands, known under the names of *llanos*, *paramos*, *mesas*, and *punos*. There are extensive low, marshy tracts along the coasts and the lake and river banks, which, however, are abundantly fertile during the dry season. For the most part, the soil of the country is fertile. In the mountainous district in the s.e. there are great tracts well suited for the production of grain. Of this region, the lands not more than 2,000 ft. above sea-level are called *tierras calidas*, or hot lands; those between 2,000 and 7,000 ft. are called *tierras templadas*, temperate lands; and those above 7,000 are the *tierras frias*, cold lands, in which the average temperature is 49° Fahr., and which are mostly uninhabited. The warmest tracts are the palm-lands; and the sago-palm, cocoa-palm, and others, grow here to a most colossal size, and yield most valuable products. Among the forest trees are the mahogany, satin-wood, rosewood, black and white ebony, and caoutchouc; and there are forests of the cinchona or Peruvian-bark tree. The cocoa and coffee trees, sugar-cane, indigo, and cotton plants are cultivated. Vegetables in great variety are raised, and tobacco is a profitable crop. Among the wild animals are the puma, ounce, and wild-cat; the jaguar is now becoming rare. The alligator, crocodile, boa-constrictor, and rattlesnake are found. Of domestic animals, great herds of cattle and wild horses roam over the *llanos*, and mules, asses, sheep, goats, and pigs are reared. The inhabitants are made up of whites of Spanish extraction; Indians, who are docile and industrious, and are the miners, agriculturists, and manufacturers of the country; some negroes and mixed races. Agriculture is the great pursuit, though only about one-tenth of the whole area is under cultivation. Manufactures are few; commerce is important, and would be much more so, were there well-constructed roads and other means of conveyance than mules. The principal articles of export are coffee, cotton, cocoa, sugar, indigo, tobacco, salt, hides, live stock, tallow, horns, sarsaparilla, dye-woods, and timber. The imports are manufactured goods, provisions, and wine. During the five years 1866-70, the imports averaged £1,000,000; the exports, £1,200,000. In 1875 the value of the imports was £3,760,000; exports, £4,028,000. The religion of the mass of the people is Roman Catholic, though other forms are tolerated.

History.—The e. coast of Venezuela was discovered by Columbus in 1498; Ojeda and Vespucci followed in 1499, and, entering lake Maracaybo, they found an Indian village constructed on piles, to prevent the evil effects of inundation, and they named the place Venezuela, or Little Venice, a name which afterward spread to the whole country. The first settlement was made at Cumana in 1520, by the Spaniards; and Venezuela remained subject to Spain till it claimed independence in 1811. It then returned to allegiance to Spain, but again revolted in 1813, and, forming with New Granada and Ecuador the republic of Colombia, was declared independent in 1819. In 1831 the states separated. See COLOMBIA. In 1865 Juan Falcon became president, but fled in 1868, when the unionists overcame the federals. In 1870 the federals regained their supremacy.

VENIAL SIN (Lat. *veniale*, pardonable, from *venia*, pardon), a term used, chiefly in Roman Catholic theology, to denote the less heinous class of offenses against the law of God. Roman Catholic divines infer from many passages of Scripture that there are various grades of guilt in the culpable actions of man, and that these varieties of guilt involve a corresponding variation in the liability to punishment which is thereby entailed. Lowest in the scale of imputability is the class of offenses known as venial, and by this name distinguished from those which are called mortal. Much difference of opinion exists even among Catholics themselves as to the nature and origin of this distinction. Some ancient writers explained mortal sins as being offenses against a *precept*, whereas venial sins are but violations of a *counsel*. This explanation, however, is now universally rejected; and it is held that sin, of its very essence, whether mortal or venial, supposes the violation of a *law* or precept. Another explanation of the difference declares mortal sin to be that which deprives the soul of sanctifying grace; whereas venial sin only weakens and diminishes, but does not utterly extinguish sanctifying grace in the soul.

This is an explanation, however, rather of the effect than of the nature of venial sin; and the more received opinion is that of St. Thomas Aquinas, who explains mortal sin to be that which of itself subverts the *end* of the law; whereas venial sin but diverts it in a greater or less degree from that to which God intended that it should be directed. Catholics, while insisting on this distinction, are careful to explain that venial sin, although absolutely pardonable, is not to be supposed to be easily pardonable. They hold that it is of its own nature a great "deordination," and that it may and does entail a heavy liability to punishment, although not to the eternal punishment of hell, which is reserved for mortal sin. Sins may be venial either objectively or subjectively; objectively, when the "object" of the law, or what is technically called the "matter" of the sin, is light or trivial; as in the case of a petty theft, a slight departure from truth, or a passing ebullition of impatience or anger; subjectively, when, even though the "matter" or "object" is grave, there is but imperfect advertence, or not full consent, on the part of the subject or agent; as in the case even of a grievous injury done without full knowledge or intention on the part of the agent, or without full and deliberate consent. The degree of culpability in each case is supposed to depend on the objective or subjective qualification of the act. Catholics hold that persons dying in a state of venial sin are not excluded forever from heaven; but that, since nothing unholy, even though in a minor degree, can approach God, the soul departing from life so stained with venial sin, is compelled to undergo a purification in purgatory (q.v.), which they conceive to be of greater or less severity and duration according to the degree of culpability. Some of these writers teach that even venial sins involve punishment of extreme severity; and all expressly declare that it is never lawful, under any circumstances, to commit the smallest venial sin, even for the purpose of compassing a good and holy object.

Protestants reject the whole doctrine of *mortal* and *venial* sins. They regard all sins as, in one sense, *mortal*, i.e., as exposing the sinner to "the wrath and curse of God, both in this world and that which is to come;" but all sins of the believer are expiated by the blood of Christ, so that there remains no penalty to be paid, either by penances in this world, or by sufferings after death. The very notion of venial sins appears to them to make light of the law of God, while that of the expiation of venial sins by the sufferings of the sinner himself, is inconsistent with their doctrine of justification, and with their views of the efficacy of the sacrifice of Christ.

VENICE, a province in n.e. Italy, bordering on the Adriatic and adjoining Treviso, Udine, Padua, and Rovigo; drained by the Adige, Brenta, and Piave rivers; pop. '71, 337,533; 850 sq. miles. The province includes several islands, many lagoons, and a tongue of land about 20 m. in length stretching along the lagoons. Parts of this strip and some of the islands are fertile. Capital, Venice.

VENICE, a fortified city of northern Italy, one of the noblest, most famous, and singular cities in the world, is built upon a crowded cluster of islets, in the lagoon of the same name, on the n.w. fringe of the Adriatic sea, 23 m. e. of Padua by the Milan and Venice railway; lat. 45° 25' n., long., 12° 20' east. The lagoon of Venice is banked off from the Adriatic by a long, narrow sand-bank, extending s.w. from the mouth of the Piave to that of the Adige, and divided into a number of islands by narrow sea-passages, six in number. Formerly, the chief of these entrances into the lagoon was the *porto di Lido*, through which all the great merchantmen of the republic passed direct into the city, and which is still frequented by small vessels, and by the Trieste steamers. The *porto di Malamocco*, between the island of the same name on the s., and that of Lido on the n., is now the deepest channel into the lagoon. Inside of this sand-bank, and between it and the mainland, which is from three to five m. distant; is the lagoon—a sheet of shallow water, navigable for vessels of very light draught, except where channels have been formed naturally by rivers, and artificially maintained. In some parts of this marshy, sea-covered plain, islets have—by the action of currents and otherwise—become consolidated into ground firm enough to be built upon, and fruitful enough to be cultivated; and in the midst of a crowded cluster of such islets, amounting in number to between 70 and 80, the city of Venice is built. In the vicinity of Venice, the ebbing tide (the difference between high and low water is only between 2 and 3 ft.) lays bare nearly everywhere a great plain of calcareous mud, laced, however, by an intricate network of narrow channels, from which the sea never retires; while at high water the whole surface is covered by the sea to the depth of from 1 to 1½ feet. The chief of the islands upon which Venice is built is called *isola de Rialto* (i.e., *riro alto*), or island of the Deep Stream. The islands, in many places only shoals, afford no good foundations for buildings; and the city, for the most part, is built upon artificial foundations of piles or stone. The fact that this city of marble palaces seems to rise vision-like from the unsubstantial sea, is sufficient to render its aspect at all times more or less fascinating; but in summer and autumn, the seasons of the highest tides, when the Grand place of St. Mark's is partially flooded, and when the image of each palace is doubled by reflection in that "green pavement, which every breeze breaks into new fantasies of rich tessellation," the city is indeed marvelously beautiful. The Canalazzo, or Grand canal—its tortuous course through the city being in the form of the letter S reversed—divides Venice into two unequal parts, and is the main thoroughfare for traffic or pleasure. But the city is sub-divided by 146 smaller canals,

or *rii*, as they are termed. These are the water-streets of Venice, by means of which passengers can be conveyed to any quarter, for here the canal is the street, and the gondola (q. v.) is the cab or carriage. Access can also be had to all parts of the town by land—across the canals by bridges, and among the houses by narrow lanes called *calli*. There are in all 306 public bridges, and of these, three cross the Grand canal—the Rialto, a stone structure, and the most famous; and two iron bridges. The piazza or square of St. Mark's is the great center of business and amusement, and the locality most frequently visited by travelers in Venice. It is 576 ft. in length, 269 ft. in greatest width, and 185 ft. in least width. The e. side of this square is occupied by St. Mark's church. The first church of St. Mark's was built in 813, but was destroyed by fire in 976. It was rebuilt in 1071, and consecrated before the close of the 11th century. The edifice is Byzantine, with Gothic additions of the 14th c., and renaissance alterations of the 17th century. It became the cathedral and seat of the patriarch in 1807. The plan of St. Mark's is the Greek cross. Above the doorway are the four famous horses which Marino Zeno brought from Constantinople in 1205, which were carried away by Napoleon in 1797 to Paris, and restored to Venice in 1815. A great dome rises over the intersection of the lines of the cross; and over the transepts, other domes arise. The carved work, which is very profuse, is of the most exquisite description; and the building is perfect as an example of the delicately-colored architecture of the east. The structure is of brick, incrustured with richly-colored marbles. To the right of this beautiful edifice is the *torre dell' Orologio* (built in 1494), with a splendid dial in gold and azure, and very complex and ingenious movements. The n. side of the square is almost entirely taken up by the *procuratie Vecchie*, built in 1517, for the accommodation of the procurators or trustees of San Marco, who had the care of the edifice, the management of its property, etc. Facing the procuratie Vecchie, and on the s. side of the square, are the buildings of the *procuratie Nuove*, which are connected with a façade, which forms the w. side of the square; and the two buildings constitute the *palazzo Imperiale*. Leading s. from the piazza is the piazzetta, or little square; and near the point where it makes an angle with the great square, is the Campanile, or bell tower, of St. Mark, placed at some distance in front of the building to which it belongs. It was begun in 903, and completed in 1510, is 323 ft. high, 42 ft. wide at the base, and is surmounted by an angel, which serves as a weather-cock, and is said to be 30 ft. high. On the w. side of the piazzetta are the old library and the mint, the former now forming a part of the *palazzo Imperiale*. At the s. of the piazzetta are the two famous red granite columns of Venice, one of which is surmounted by a figure of St. Theodore, the patron saint of the republic till St. Mark supplanted him; the other covered by the lion of St. Mark. On the e. side of the piazzetta stands the *plazzo ducale* or doge's palace. The first palace reared on the site of the present one was built in 813, and though frequently enlarged, rebuilt, and re-decorated, it retained throughout the character of a Byzantine structure. In the year 1301, its architectural character began to change; and from that time till 1423, all the rebuilding and enlarging were executed in Gothic. After the date 1423, there are no buildings in Venetian architecture, properly so called; and the alterations made in the ducal palace after that time, as well as the palaces subsequently built, which took their style of architecture from the doge's palace, were in renaissance, and like almost all the architecture now to be seen in Venice, "of immeasurably inferior spirit in the workmanship" to that native style which flourished with the republic, and decayed with it. Starting from the landing-place of St. Mark's at the e. extremity of the Grand canal, and proceeding w., a great number of palaces are passed. In former times, these palaces, or the magnificent buildings which occupied the same sites, were the warehouses and places of business of the great merchant-princes, most of whom possessed mansions in the suburbs, i. e., on some neighboring island, which afforded more privacy than could be found in the city itself. A few of these are worthy of mention. Among them are the *Palazzo Giustiniani*, now the *Albergo dell' Europa*, perhaps the best hotel in Venice; the *Palazzo Contarini Fasan*, a beautiful specimen of the richest Venetian Gothic of the 14th c.; on the left bank, the *Palazzo Pisani a S. Polo*, in arabesque Gothic of the beginning of the 15th c.; further on, on the right, the *Palazzo Loredan*, the *Cic d'Oro*, a building of the 15th c., in the oriental style, restored by Mlle. Taglion, the celebrated dancer. The bridge of the Rialto crossing the Grand canal consists of one arch, the span of which is 91 ft., and the height from the water 24½ feet. The width is 72 ft., and the bridge is divided into three streets—the middle one 21 ft. wide—and two rows of shops. The Bridge of Sighs (*Ponte dei Sospiri*) stretches across the canal called the Rio Palazzo, and communicates between prisons on the e., and the Doge's palace on the w. bank of the canal. It is a covered gallery; and prisoners, when led to execution, passed from their cells across this gallery to the palace, to hear sentence of death passed upon them, and then were conducted to the scene of death between the red columns. The churches of Venice are, as a rule, fine edifices, and of various styles. The styles are chiefly, first, Venetian Gothic, massive and solemn; second, Lombard; third, classical, i. e., Italian; fourth, decorated Italian. Among the chief churches after St. Mark's are those of the *Favari*, with a colossal monument of Titian, a number of excellent pictures, etc.; and the church of *S. Giacomo di Rialto*, at the foot of the bridge of the same name, occupies the site of the first church erected in Venice in 421. But of the multitude of churches, a great many, though of pleasing proportions, are in the later and degraded

styles of architecture. The fine art *academia* is located in the ancient convent of *La Carità*, was formed in 1807 by Napoleon, and consists of several schools, and has the finest collection of pictures of the Venetian school, including works by Titian, Tintoretto, Bonifacio, Giovanni Bellini, Paolo Veronese, and many other masters. Specimens of the works of these artists are also to be found in many of the palaces and churches of the city. There are several theaters, the chief of which is *la Fenice*. Fresh water, formerly, and even still to some extent, obtained at great expense, and of bad quality, from the mainland, or kept in cisterns, is now obtained by means of a number of artesian wells, sunk in 1847, at the expense of the municipality. The library of St. Mark's contains 120,000 vols., and 10,000 MSS. Many writers have led to misconception by omitting to note the fact, that the Venice of to-day is by no means the same city as the Venice of earlier and more famous days. On this subject, it will be of interest to quote the following from Ruskin's *Stones of Venice* (vol. ii., pp. 4, 5): "The Venice of modern fiction and drama is a thing of yesterday, a mere efflorescence of decay, a stage dream, which the first ray of daylight must dissipate into dust. No prisoner whose name is worth remembering, or whose sorrows deserved sympathy, ever crossed that 'Bridge of Sighs,' which is the center of the Byronic ideal of Venice; no great merchant of Venice ever saw that Rialto, under which the traveler now passes with breathless interest." Among the chief manufactories of Venice are the glass-works, in which magnificent mirrors, artificial pearls, gems, colored beads, etc., are made, and which employ 4,500 people. Jewelry, especially chains of the precious metals, gold and silver stuffs, silks, laces, velvets, soap, earthenware, wax-candles, etc., are also manufactured; and sugar-refining and ship-building are carried on. The trade of Venice greatly declined for several years previous to 1866. This decline, however, being due to the uncertainty and unsatisfactory political state of the Venetian provinces, there have been signs of revival since the incorporation of Venice with Italy. In 1874, the value of the total imports amounted to £10,019,265; that of the exports to £7,992,397. The goods imported consist chiefly of cotton, coals, coffee, colonial produce, woolen and linen yarns, and manufactured goods; and the exports of grain, fruits, fish, wine, etc. In the same year 3,475 vessels (including coasters), of 578,741 tons, entered the port. In 1877, 200 British steamers and 11 British sailing vessels entered the port. Pop. '72, 128,901.

History.—Previously to the Roman conquest, we know almost nothing of the history of Venetia; but, at the time when that event took place, we know that this region was inhabited by two nations, the Veneti and the Carni. The Veneti, from whom the district derived its name, occupied the tract between the Plavis (Piave) on the n., and the Athesis (Adige) on the south. The origin and affinities of this people are unknown, and almost the first thing ascertained concerning them is that, in the very earliest times of which we have any record, we find them a commercial rather than a warlike community, carrying on a trade in amber, which they brought from the shores of the Baltic, and sold to the merchants of Phenecia and Greece. Under the Roman empire, the province became opulent and flourishing; and besides its capital, Aquileia, which rose to be one of the most prosperous cities in Italy, it contained also the powerful and wealthy provincial cities, Patavium (Padua) and Verona, and numerous important towns. But before the close of the empire, the early prosperity of this province was swept away by the Huns under Attila, who, in 452, raised Aquileia to the ground, and devastated the cities of Concordia, Altinum, Patavium, Vicentia, Verona, and other cities of the province. Many of the inhabitants of these cities, driven from their ruined homes, sought shelter in the marshy lagoons, in a position too miserable to provoke the ambition of the conquerors, and defended from invasion from the main-land by the wide tract of muddy shallows which intervened between it and the actual shore, and secured against attack by sea by the shallowness of the water and the intricacy of the sea-passages. Of the cluster of islands upon which ancient Venice stood, the principal were Grado, Bibione, Caorlo, Heraclia, Equilo, Torcello, Murano, Rialto, Malamocco, Pelestrina, Brondolo, San Nicolo, Chioggia (Piccola and Grande), Amiano, Costanziano, Olivolo, and Spina-lunga. To Rialto and to Malamocco, the refugees from Padua resorted. The name of the province they had left was afterward transferred to the cluster of the islands of the lagoon—the new settlement being commonly known, at least as early as the 8th c., as Venezia, or as we have it, Venice. Protected by the peculiar position of the islands in which they had found refuge, the early settlers devoted themselves to the pursuits for which their situation offered the greatest facilities—fishing and the manufacture of salt. Houses began to cluster thickly on the Rialto; and when, in 568, Padua was sacked by the Lombards, many of its inhabitants emigrated to that infant colony which their ancestors had helped to found. The first form of government of the island-commonwealth was republican, administered by a consular triumvirate; but in 457 the consuls were superseded by tribunes who, elected annually, and varying in number at different times from 1 to 12, administered the government for 240 years. But during this period, although the young republic progressed in wealth and population, it did little to increase its political importance. Society was divided into factions by the ambition of the rival tribunes, and variety of interests rendered united action in warfare impossible. With the purpose of remedying the many evils of the government, Cristoforo, patriarch of Grado, in 697, laid before the arengo—the periodical convention of the whole adult male population—a scheme in which he proposed that the tribunes should abdicate sovereign

power, and that a magistrate, with the title of duke or doge, in whom should be vested undivided authority in civic, ecclesiastical, and military matters, should be placed over them. The proposition was received with much favor, and the election to the office fell upon Paolo Luca Anafesto, who was invested by the metropolitan with his insignia of office, a crown of gold, and a scepter of ivory, March, 697. Anafesto remained at the head of affairs till his death in 717, and under his rule the position of the republic greatly improved. Civil discords were in great measure stilled, and the Venetian territory was increased by the acquisition of a strip of the main-land, obtained by treaty from the king of the Lombards. Under Orso, the third doge (720-737); the Venetians entered upon that career of enterprise in which their prudence and their valor were always equally conspicuous, and which they continued to pursue to the last. In 735 the Lombards seized Ravenna, compelling the exarch (q. v.) to seek shelter in the lagoon, and implore the republic to lend her aid in reacquiring the lost territory. Still considering themselves as nominally subject to the eastern emperor, besides being anxious, in the interests of their commerce, of securing the alliance of Constantinople, and of obtaining the freedom of the seas of the eastern empire, the Venetians supplied the required assistance, and reinstated the exarch in his vice-royalty. The services of the doge on this occasion were rewarded by the Byzantine court with the honorary title of hypatos, or imperial consul. The common punishment among the Venetians for tyranny was putting out the eyes, and the reigns of several of the doges at this time are but periods of tyranny and excess on the part of the ruler, terminated by exoculation or assassination by the people. By a treaty concluded in 803 between Charlemagne and the emperor of the east, it was stipulated that the maritime towns of Istria and Dalmatia should be considered an integral portion of the eastern empire. This stipulation was adhered to till the year 808, when the aggressive policy of Charlemagne and of his son Pepin, now king of Italy, prompted Nicephorus, the emperor of the east, to dispatch a squadron to the Adriatic, and to seek the alliance of the Venetians; and as the latter perceived that they had much more to gain from the friendship of the court of Constantinople—the key to the rich waters of the east—than from that of Charlemagne, the alliance was soon cemented. War immediately broke out, and Venice was invaded by king Pepin, who took a number of the islands without meeting any resistance—the inhabitants having all been transferred to the central island, Rialto. The French advanced to the island of Albiola, when, to their dismay, they found that the tide had been ebbing, and that their vessels were stranded in these shallows. The whole French squadron now fell an easy prey to the swift-moving galleys of the Venetians, and such of the enemy as escaped being drowned were massacred by the relentless islanders (809). This struggle, called the battle of Albiola, was conducted on the part of the republic by Angelo Badoer, tribune of the island of Rialto, who was raised to the rank of doge, and transferred the seat of government to Rialto—the island of Heraclia and others having previously enjoyed that honor. In his reign, also, connection was established between Rialto and all the circumjacent islands, by means of wooden bridges, and the cluster thus united now formally took the name Venezia (Venice), although it commonly received that name early in the previous century. The year 829 is memorable as that in which, according to tradition, the body of St. Mark was transferred to Venice from Alexandria. "That the Venetians possessed themselves of his body in the 9th c., there appears," says Ruskin, "no sufficient reason to doubt;" and however we may regard this story, it cannot be denied that the belief in it by the Venetians and others attracted crowds of pious pilgrims to Rialto, and thus increased the traffic and prestige of the port; while the Venetians adopted St. Mark as their patron saint; and their war cry, "Viva San Marco!" inspired their courage in many a fight, both on sea and land. For many years after this date the history of Venice is marked by no event of special note; but the naval importance, the commerce and wealth, and refinement of the republic, increased year by year. Dodge Orscolo II. (991-1008) greatly extended the trade of the republic by establishing commercial relations between it and the empires both of the east and west, the Crimea, Syria, Egypt, Tartary, Tunis, etc.; and under his rule, the territory of Venice, which, until lately, comprised only the islands of the lagoon, and a narrow slip of territory on the mainland, was increased by further acquisitions on the mainland, and by the addition of the sea-boards of Dalmatia and Istria, which he annexed in 998. In 1085 the provinces of Dalmatia and Croatia were formally ceded to Venice by the emperor of the east; and at the same time the emperor exempted the Venetian traders in all parts of the empire, excepting in Cyprus, Candia, and Megalopolis, from all duties and imposts whatever. In 1099 Venice sent forth a fleet of 207 vessels of all sail to the succor of Godfrey de Bouillon and his companions of the first crusade. The defeat of a hostile Pisan fleet employed by the eastern emperor, Alexius Comnenus, and the capture of 20 of the vessels, and the obtaining of the body of St. Nicholas at the island of Myra, were the chief incidents of this expedition, which partook more of the nature of a predatory cruise than of a pilgrimage and crusade. But it is noticeable that in all the cases in which Venice joined the crusaders, the chief motive seems rather to have been to monopolise the maritime department of all these movements, and to extend her commercial relations, than to secure the holy sepulcher in Christian possession. The great fires of 1106, which, besides destroying the island city of Malamocco, reduced 30 churches and vast numbers of private dwellings in Venice to ashes, were indirectly the

cause of great improvements in the architecture of the city; for previously to this event, the dwellings of the Venetians were almost all built of wood; but after it, the material used was always either stone or marble obtained from Italy, Istria, or Dalmatia, in all of which it is found in abundance. In 1111 the doge Faliero sent forth 100 galleys to aid Baldwin I., the successor of Godfrey de Bouillon, in the conquest of such Syrian ports as remained in the hands of the Mussulmans; and for the assistance thus rendered, the Venetians obtained the right to hold in possession a church, street, mill, bakery, bath, etc., and to be represented by a local magistrate in each of the oriental possessions of christendom—rights of the very greatest importance to a trading community. In 1123 a fleet sent to succor the Christians in Palestine, and led by the doge Michieli, distinguished itself by gaining a magnificent victory over an Egyptian fleet, and by the capture of ten Turkish galleons richly freighted. In the same year, the Venetians and their allies, the Christians in Palestine, reduced the almost impregnable city of Tyre, after a siege of four and a half months. In 1122 a decree was passed by Johannes Comnenus, the eastern emperor, commanding the Venetian residents at Constantinople and the other Greek ports to quit the imperial dominions, and declaring the suspension of all intercourse between the two powers. The islanders thus saw the most profitable branch of their commerce threatened with extinction; and resolved to make reprisals, they launched a fleet in 1123, and in that and the following year they inflicted a terrible punishment on the empire, capturing Rhodes, and investing and sacking Andros, Samos, etc., all the Ionian islands, a portion of the Peloponnesus, etc. Further, this brilliant expedition was not brought to a close until all the Dalmatian fiefs, stirred to insurrection by Stephen, king of Hungary, were again reduced to submission. The Venetians were prominent members of the league of Lombardy against the German emperor; and in 1177 won a splendid victory over the Ghibellines, headed by Otho, son of Frederick Barbarossa, in defense of pope Alexander III., who had appealed for protection to the republic. Otho's squadron numbered 75 sail, chiefly drawn from the ports of Genoa and Ancona; the Venetian force consisted of 34 large galleys; and the victory they gained influenced the pope to show his gratitude by presenting the doge Ziani with a ring, with which he commanded him to wed the Adriatic, that posterity might know that the sea was subject to Venice "as a bride is to her husband;" and it is recorded that in this year the pompous ceremony of the "marriage" was celebrated for the first time. The result of the naval battle of Saboro was that Frederick agreed to a congress, which took place at Venice in 1177. On the occasion of this congress, when the pope, the doge, and other dignitaries were assembled in the palace of St. Mark's, Frederick approaching the throne on which Alexander III. was sitting, and prostrating himself, allowed the pope to plant his foot upon his neck. The congress of Venice restored peace between the empire and Lombardy and Sicily. The doge Ziani died in 1178. He did much to improve the architecture of the city, especially of the square of St. Mark. Of the three lofty red granite pillars which he is believed to have brought from the island of Seio, two adorn the portico of St. Mark's—the third fell overboard and was lost in the attempt to land it. In Oct., 1202 the expedition known as the fourth crusade set out from Venice, in Venetian vessels, under the command of the venerable doge, Arrigo Dandolo; it did not, however, reach Palestine, but directed its force against the Byzantine empire, which fell into the hands of the so-called crusaders, April 1204. See DANDOLO. On the division of the conquests of this expedition, Venice received the Morea, the Illyric isles, a large portion of Thessaly, the Sporades, the Cyclades, the cities of Adrianople, Trajanople, Dedymotichos, and Durazzo, the province of Servia, and the coasts of the Hellespont. A fourth part of Constantinople was set apart as a quarter where the Venetians might reside, under the protection of their own laws; and all restrictions as to trade were abolished. Venice was now in possession of the fairest portions of the lower empire, and she had long been undisputed mistress of the seas. As she increased in power, she also increased in magnificence; and her nobles, having no lands in which they might employ their wealth, lavished immense sums upon their palaces, their pictures, decorations, and costly garments. Her palaces were decorated with the treasures and spoils of the east, and a school of artists arose, who found noble subjects for their pencils in the deeds of Faliero, Polani, Ziani, and the Dandoli. Her noblemen were now the most opulent in Europe, and travel and refinement had made them also the most polished. The most notable events in the history of Venice during the 13th c. are her wars with Genoa, in which her hitherto unflinching good fortune deserted her, and the star of Dandolo succumbed to that of Doria at the desperate battle of Corzuola, from which conflict the Venetians could only retire with 12 out of 96 of their galleys, the others being taken or burned; the truce effected between Venice and Palæologus, the emperor of the east, in 1268; the electoral reforms by which, after a complex and often repeated process of election and reduction by lot, the forty-one members were chosen who formed the electoral college, and of whom it was necessary that the doge-elect should obtain at least the votes of twenty-five. In 1289 the inquisition was formally established in Venice, but this institution was rendered subject to so many limitations by the government of the republic, that it remained comparatively harmless. In 1310 a conspiracy was formed for the correction of abuses that had crept into the constitution, and for the punishment of actual and fancied crimes. Among the conspirators were members of many of the noblest families of Venice. This

conspiracy, known as the Quirini-Tiepolo conspiracy, proved abortive; but among other reforms to which it gave rise was the formation of the famous council of ten, who caused themselves to be declared a permanent assembly in 1335. In 1343, Andrea Dandolo, born in the year of the Quirini-Tiepolo conspiracy, a most accomplished scholar and statesman, was raised to the dogate. His *Venetian Annals*, remarkable for their precision and accuracy, place their author in the first rank of mediæval historians. In 1348, the lagoon was visited by an earthquake, accompanied by unusually high and destructive tides. These misfortunes were followed in the same year by a most frightful visitation of plague; and in the course of the six or seven months during which the epidemic raged, two fifths of the population of the city perished, and fifty patrician families became extinct. The middle of the 14th c. is remarkable for the famous conspiracy headed by the doge Marino Faliero (see FALIERI), and for a war with Hungary, in which Venice lost Dalmatia. The commercial rivalry of Venice and Genoa in the east led to a war in 1352, in which the Venetians were defeated (Feb. 13, 1352) by Paganino Doria in the straits of the Bosphorus; and though they recovered their lost laurels in a battle (Aug. 29, 1353) off the Sardinian coast, their fleet was totally destroyed by Doria, in the gulf of Sapinoza, Nov. 3, 1354, and they were forced to make peace in the following May. In 1378, the Venetians interfered in the quarrel between the Genoese and Cypriots, and their fleet vanquished that of the Genoese before Antium (July), in revenge for which the Venetian fleet was almost annihilated off Pola (May, 1379), and Pietro Doria, advancing upon Venice itself, seized the island of Chioggia. But the courage of the Venetians was nothing weakened by their dreadful reverses, and they soon changed the aspect of affairs by becoming in turn the besiegers themselves, blockading the enemy in Chioggia, and, after reducing him to the brink of starvation, accepting an unconditional surrender, June, 1380. In 1396 Genoa, the oldest and most harassing foe of the republic, ceased to have separate existence as an enemy, for in that year she placed herself under the dominion of the king of France, an arrangement which afforded immeasurable relief to Venice, because, for several reasons, there was now much less chance of a rupture between the two maritime powers. For a number of years after this event, Venice experienced the highest prosperity: a prodigious impulse was given to her trade; her argosies traversed every arm of the ocean; intimate intercourse was kept up with every European country, as well as with Syria, Egypt, and even India, and important articles of Venetian merchandise were the iron of Staffordshire, the tin of Cornwall and Devon, and the wool of Sussex. But no less beneficent than the effects of peace were those of the war which soon broke out between Novello, lord of Padua, and Venice. At the conclusion of this war (1407), Venice found herself in the possession of an empire on the mainland of Italy, the smallest communal section of which equaled their ancient island domain, and of which the principal cities were Vicenza, Verona, Padua, Feltre, and Belluno. With the death of the doge Mocenigo in 1423, a new era in the existence of Venice commences, for now "the central epoch of her life was past, the decay had already begun." During the next thirty years, war was continually waged, chiefly against the dukes of Milan, in the course of which Venice, taking into pay Carmagnola (q.v.) and his hands achieved many a splendid victory, and suffered many a disastrous defeat; and though, on the return of peace (1455), the territory of the republic was materially increased, by the acquisition of Brescia, Bergamo, Treviso, etc., on the mainland, this territory was obtained only after a struggle, enormously expensive in life and treasure, and during the continuance of which the commerce of Venice—the well-spring of its prosperity at all times—began to decline. Mocenigo's last advice to the senate was to avoid war, which was certain to bring destruction on the country, and to prosecute industriously their trade and commerce, and cultivate the arts of peace. The rejection of this advice, combined with the narrow-minded selfish policy always pursued by the Venetians in the contests among the Italian states, was the prominent cause of its decline. The same fatal warlike policy was pursued throughout the 15th c.; and the whole of the 16th c. was employed by them in repairing the disasters which the league of Cambrai had brought upon them. Her policy in the 17th c. was to aid the opponents of her most dangerous neighbor, Austria, by recognizing Henry IV. of France, aiding Bethlem Gabor and Ragotski, the duke of Savoy against Spain, and the Protestants against the Catholics of the Grisons. From 1646 to 1669, war was carried on between the Venetians and Turks, the latter being, in almost every encounter, severely defeated, though, from the disproportionate strength of the antagonists, they ultimately gained Candia, the object of the war. The discovery of the cape of Good Hope by the Portuguese in 1486, opened up to that nation an ocean-route to India, which was taken advantage of by Vasco da Gama, who rounded the cape on his voyage from Lisbon to Calicut in 1497. The carrying-trade of the world was now no longer, as it had been, in the hands of the Venetians; and the vast commercial activity which sprang up among the western nations of Europe upon the discovery of America clearly showed that the naval superiority of the republic had forever disappeared. But even in spite of these changes of fortune, Venice might still have maintained a respectable mediocrity among maritime states, but for the character of her government, which was conducted by an exclusive oligarchy, in whose hands alone all power and freedom were vested. Long prior to the invasion of the republic by Napoleon in 1796, Venice had become worn out and corrupted; the government of the council of ten had become a reign of terror: its nobles

showed vigor only in the pursuit of pleasure; its peasants, inured to peace, were unequal to war—all the ancient virtue, valor, and hardihood, which had raised a colony of fishermen, "perched like sea-fowl" on a muddy shoal, to be a nation of the first rank, had died out of the state. Napoleon forced Venice to break the neutrality which it meant to maintain in 1796, destroyed its government, and ceded the province to Austria by the treaty of Campo-Formio (q.v.). In 1806, the city of Venice, with the territory of Venetia, was annexed to the kingdom of Italy by the treaty of Presburg (q.v.); but it was transferred to Austria in 1814. In 1866 the city and territory were ceded to and incorporated with the kingdom of Italy.

VENETIA, TERRITORY OF, ceded to Austria in 1815 (see **VENICE, HISTORY OF**), formed from that year, along with Lombardy (q.v.), what was called the Lombardo-Venetian kingdom, one of the Austrian crownlands. In 1859 Lombardy was ceded to Italy, but Venetia continued in the possession of the Austrians till 1866, when, as one of the results of the famous "Month's War," it also was ceded to Italy, and is now incorporated with that kingdom. While still in Austrian possession, Venetia was regarded as bounded on the n. by the Austrian crownlands of the Tyrol and Carinthia; on the e. by Görz and Gradisca; on the s. by the Adriatic sea, the river Po, and the duchy of Modena; and on the w. by the river Adige and the Tyrol. Area, 9,024 sq.m.; pop. '71, 2,641,060. The territory of Venetia, ceded to Italy by the treaty of peace, Oct. 3, 1866, has the same frontiers which it had as an Austrian province.

VENI CREATOR SPIRITUS, an ancient and very celebrated hymn of the Roman breviary, which occurs in the offices of the feast of Pentecost, and which is used in many of the most solemn services of the Roman Catholic church. Its author is not known with certainty. On the authority of an ancient life of Notker, it is ascribed to Charlemagne; and Daniel, in his *Thesaurus Hymnologicus*, adopts this opinion; but it seems to be certainly older than the age of Charlemagne; and its correct classical meter, as well as the purity of its language, bespeak an earlier and purer age. Mone makes it highly probable, by intrinsic evidence, that it is the composition of pope Gregory I. The *Veni Creator Spiritus* must not be confounded with another hymn to the Holy Ghost, *Veni Sancte Spiritus*, which somewhat resembles it. The latter belongs not to the breviary, but to the missal, in which it forms a "sequence" in the mass of Pentecost Sunday and Octave. The latter hymn is not in classical meter, but in rhyme; and its language is plainly of a lower age. The author of the *Veni Sancte Spiritus* is believed to be King Robert of France, to whom several other hymns of the same class are attributed.

VENIRE, or VENIRE FACIAS, in law, a writ to the sheriff of the county, ordering him to choose and summon from the county, and have in court on a day named a certain number of qualified citizens of such county to act as jurors in the court. This was the common law method of summoning a jury, but in many states jurors are drawn by lot from a list of qualified persons made by the proper local authorities; in New England, by the selectmen of the town. The sheriff then summons without a *venire*, which is, however, still used to summon additional jurors.

VENLO, a small but strongly fortified t. in the Netherlands, province of Limburg, is situated on the right bank of the Maas, 45 m. n.e. of Maastricht, and has a safe little haven. The fortifications are very irregular, consisting of a main wall, canal, outworks, three powder-magazines, etc. The town is well built, and stands on elevated ground, surrounded by morasses. Principal buildings are the town-house, the great arsenal, the church of St. Martin, etc. Venlo has good schools and several charitable institutions. Pop. '76, 8,494. The Roman Catholics number upward of 7,000; the remainder, except 100 Jews, being Protestants.

The principal means of living is trade with Germany in coal, stone, lime, iron, bricks, grain, etc.; besides stone-hewing, tanning leather, dyeing, grinding corn, beer-brewing, making cigars, starch, vinegar, chocolate, Venlo pepper-cake, etc.

Venlo was walled by duke Reynold of Gelder in 1343. It has many a time felt the horrors of a siege, and been taken and retaken, the last time by the Belgians in 1830, in whose hands it remained till the conference of London, June 22, 1839, when it returned to the Dutch.

VENN, Rev. HENRY, a pious "evangelical" clergyman of the English church, was b. at Burnes in Surrey in 1725. Having studied and entered into holy orders—in this respect following the example of his paternal ancestors since the reformation—he was shortly after appointed curate of Clapham. In 1759 he resigned his curacy to become vicar of Huddersfield in Yorkshire, which he left in 1769, on being presented to the rectory of Yelling in Huntingdonshire. He died in the house of his son, John Venn, rector of Clapham, in June, 1797. The memory of his pure life, good example, and earnest preaching was cherished for many years after his death in the places which had benefited by his ministrations; and his name is associated with those of John Newton, Thomas Scott, Charles Simcon, and others, as having had considerable influence on the evangelical movement in the church of England. Venn was the author of a book entitled *The Complete Duty of Man*, a sort of development or extension of the *Whole Duty of Man*. His *Life and Correspondence* was published by his grandson, Henry Venn, in 1839.

VENOMOUS BITES AND STINGS. Under this title are considered all wounds inflicted by animals which by their bites or stings introduce poisonous or irritating matter into the bodies of their victims. In this country the subject is of comparatively little importance, since it is very seldom that the bite of our most venomous animal—the adder—is fatal; but in warmer countries it demands the serious attention of the surgeon. Following Mr. Busk, in his article on “Venomous Insects and Reptiles,” in Holmes’s *System of Surgery*, we shall briefly enumerate the most venomous animals found (1) among the invertebrata, and (2) among the vertebrata.

(1) Among the invertebrata, the most formidable poisonous animals are to be found in the classes *arachnida*, *myriapoda*, and *insecta*. The *scorpions* are characterized by a prolonged jointed abdomen, terminating in a hooked claw, which is perforated, and connected at the base with poison-glands. The larger species, which are restricted to hot countries, by their sting give rise to symptoms of great severity, and occasionally cause death. “The symptoms resemble those produced by the stings of wasps and bees in an aggravated degree, such as acute pain, a general nervous shock attended with numbness, vertigo, occasionally temporary loss of sight, vomiting, etc.; while the local symptoms are swelling, and other signs of acute inflammation, followed, in many cases, by suppuration, sloughing, and their consequences. The remedy which appears to have obtained the greatest repute, is the application of ammonia externally, and its internal administration as a stimulant also; although it is probable that any other diffusible stimulus, combined with opiates, would be equally, if not more efficacious.”—Busk, *op. cit.*, p. 921. Several species of *scelopendra*, or *centipedes*, are regarded as highly venomous, and there is no doubt that the bites of some of the larger kinds inhabiting hot countries (especially of *S. morsitans*), give rise to excessively painful consequences, although less severe than those occasioned by the sting of the scorpion. In these animals, the poison is introduced not by a caudal sting, but by perforated curved fangs, connected with the mandibles, where poison glands doubtless exist, though their existence has not been clearly established on anatomical evidence. Although *spiders* have long had a bad reputation for their venomous bites, it is quite certain that (with certain rare and foreign exceptions) their bite inflicts no more than a simple wound. The most ill-famed of the spiders is the tarantula or tarentula (*lycosa tarantula*), a citigrade or running spider, common in south Italy. See TARANTISM. Direct experiments, however, show that the bite of this spider merely causes a slight local irritation. There is a spider inhabiting the island of Elba (*aranea 13-guttata*), which is said to be dangerous and even fatal to men and domestic animals; while the cork-forests of Morocco are said to be infested by an equally formidable spider, which is there known as the *tenderman*. It would be well if scientific travelers in those countries would obtain more definite information regarding these spiders. Among insects, many inflict more or less troublesome bites, while a comparatively few (and those almost, if not altogether, restricted to the order *hymenoptera*) inflict serious injury by their stings.

In the case of the majority of biting insects, it is very doubtful whether the local discomfort is due to the introduction of poison, or is the consequence of the prolonged mechanical irritation only. In some cases, as in the ants, we know that formic acid (an irritant of great power) is introduced; and considering the prolonged irritation that follows the bites of many small insects, it is probable that there is some special acrid matter in their salivary secretion. This view is further borne out by the fact, that persons who suffer much from the bites of fleas and bugs (and the degree of annoyance varies extremely in different persons), are relieved by the local application of hartshorn, or some other preparation of ammonia. The “tsetse” (*glossinia morsitans*), whose ravages are so graphically described by Dr. Livingstone, does not attack man, but it affords an example of an insect, very little larger than a house-fly, being able to secrete an intense septic poison, which, introduced by its bites, causes certain death to cattle, the sheep, horse, and dog, while it is innocuous not only to man, but to the goat, antelope, ass, and pig, to all wild animals, and to the calf until it is weaned. Another insect, mentioned but not described by the same traveler, produces by its bite vomiting and purging in man. In the case of stinging insects, the stinging instrument consists essentially of two fine and sharp darts, inclosed in a tubular sheath, at the base of which is a poison-sac, whose contents are injected into the wound made by the darts, which are usually serrated or barbed. The consequences of the sting of a bee or wasp are too familiar to require any detailed notice; and the sting of the hornet, a much rarer insect, is of the same nature, but of an aggravated form. The sting of a bee or wasp scarcely ever proves fatal, except the insect is swallowed in a cavity in ripe fruit, or in the act of drinking, and inflicts its sting on the throat. A sting in the fauces usually excites severe and diffuse inflammation, which may extend to the glottis, and thus cause suffocation. The treatment must be prompt, and consist of scarification internally, leeches externally, and possibly tracheotomy. When a large number of any of these insects make a combined attack, the result may be fatal. For the bites and stings of all these animals, the remedy recommended for scorpion-stings must be used; namely, ammonia in some form or other, and probably sal-volatile is the best. Among various domestic remedies for allaying the irritation excited by these stings, are vinegar, oil, spirits, eau-de-cologne, the blue-ball employed by washerwomen, consisting of indigo, etc. If possible, the sting

should be extracted by bringing it to view by pressure over the wound with a watch-key, and then seizing it by small forceps.

(2) Among the vertebrata, the only animals capable of inflicting poisoned wounds are the ophidian reptiles or snakes. As the description of the mechanism of the poison-fangs of venomous snakes is sufficiently given in the article SERPENTS, we may pass on to the subject of the nature of the *venom* and its effects. The venom is described, when fresh, as a transparent, yellowish or greenish, somewhat viscid, neutral fluid, much resembling saliva in its physical character, and exhibiting no obvious indication of its virulent nature. According to prince Lucien Bonaparte, it contains, in addition to albuminous or mucous and fatty matters and the usual salts, a peculiar principle, to which he has given the name *echidnine* or *vipérine*, which appears to be the active poisonous matter. The poison of the most deadly serpent produces no effect when introduced into the stomachs of living animals, excepting a slight irritation of the air-passages; nor is its effect more serious when applied to the surface of the skin when free from abrasion. From the experiments of Fontana "on the poison of the viper," and other observers, it seems that the venom must be introduced, directly into the subcutaneous cellular tissue. When, however, properly introduced, as through its natural channel, the poison-fang, "its effects are very rapidly manifested; in fact, in some cases so rapidly as more to resemble those of prussic acid than anything else; usually, however, a brief interval elapses before the effects are shown. These may be divided into general and local. The first symptoms in nearly all cases appear to be a general shock to the nervous system, attended with faintness, tremor, and great depression, sometimes with stupor, loss of sight, vomiting, lockjaw, and general insensibility; at the same time, great and sometimes intense local pain is set up. The limb, if the wound is in one of the extremities, rapidly swells. In severe cases, the swelling continues to spread till it reaches the trunk, or even the entire body, whose surface assumes a jaundiced hue. The gravity of the effects of the bite of a venomous snake appears to be in direct ratio to the comparative sizes of the snake and its victim, and also to the quantity of the poisonous secretion present at the time in the saccular gland. It is also greatly governed by the situation of the wound; one on an extremity, for example, being far less dangerous than one on the face or trunk. It has been remarked that two or more wounds at distant points are more rapidly effective than when they are inflicted on one spot."—Busk, *op. cit.*, pp. 926, 927. The poison is one which seems to act primarily on the nervous system, and also to have a septic action on the tissues with which it is brought in contact; and in order to produce its effects, it must be directly introduced into the circulation.

The viper is the only poisonous snake in this country; but in other countries, there are many snakes whose bite is fatal. America possesses the rattlesnake; the East Indies, the cobra da capello, the ophiophagus, daboia Russellii, etc.; and Africa and Australia are rich in poisonous reptiles. The bite of the viper presents in a mild form the typical symptoms which have been described, and is very seldom fatal. In the case of many snake-bites, however, rapid death is the general result; and should recovery take place, it will often be very protracted and imperfect.

The symptoms produced by the bites of different kinds of venomous serpents, differ considerably in character as well as in intensity, although there is a general resemblance.

The treatment may be divided into local and general. The local treatment consists in the *immediate* application of a ligature drawn as tightly as possible above the wound—provided the situation of the latter allow of it—to prevent absorption, and the excision and cauterization of the bitten part, and then, after bathing it with warm water, sucking or capping it. When the position of the bite prevents free excision, the poisoned tissues must be destroyed by *liquor ammoniac*, or nitric acid. The general or constitutional measures consist essentially in the very free administration of the most powerful diffusible stimulants, such as hot strong brandy or whiskey and water, and ammonia (an ammoniacal preparation, known as *eau de luce*, is a popular remedy for snake-bites). In these cases, in consequence of the prostration of the patient, he can bear an extraordinary quantity of stimulants. For the bite of the rattlesnake, the popular treatment is to make the patient drunk—a process known as the *western cure*. Olive oil, freely administered, has been strongly advocated. We append in a foot-note* a few of the so-called specific remedies said to be adopted by the inhabitants of countries where the most virulent serpents abound.

VENOSA (anc. *Venusia*), a t. of southern Italy, in the province of Basilicata, 100 m. e.n.e. of Naples. Its castle, which gives a picturesque effect to the quarter in which it is placed, is now in ruins. The Norman abbey of the holy Trinity, founded by the Norman, Robert Guiscard, and consecrated in 1059, though now in ruins, is imposing from its magnitude and regularity, as well as interesting from its antiquity. But the unflinching interest of Venosa arises from its being the birthplace of Horace (q.v.). In one of the streets is a column surmounted by the bust of the poet; and many of the localities of the vicinity can be identified with the places he has immortalized. Pop. about 7,000.

* Decoction of Virginian snake-root: *radix corinæ*; guaco, or the *sacra vite anchora*; the Tan-jure pill, whose chief ingredient is arsenic. See the article SNAKE-STONES.

VENT, or **TOUGH-HOLE.** See **GUN.**

VENTILATION. See **WARMING AND VENTILATION.**

VENTIMIGLIA, a small fortified t. of northern Italy, in the province of Port Maurice, stands on a promontory on the sea-shore, 18 m. e. of Nice. Besides an old cathedral, it contains the church of St. Michel, containing two Roman milestones, and inscriptions by Augustus and Antoninus Pius. The strongly fortified castle above the town, recently repaired and strengthened, is the chief stronghold between Genoa and Nice. Wines and fruits are produced. Ventimiglia, the ancient *Albium Intemelium*, was the capital of the Intemelians, a Ligurian tribe; and its possession was contested in the middle ages by the Genoese, the counts of Provence, and the dukes of Savoy. Pop. 4,080.

VENTNOR, the principal t. on the s. shore of the isle of Wight, 10 m. s.e. of Newport. It is situated amid the finest of the fine scenery of the Undercliff. Fossils are found in great quantity in the vicinity. With a fine southern exposure, and well sheltered from the n., Ventnor possesses a mild climate, suitable for various classes of invalids, and has accordingly become a favorite winter and spring resort. The town is well provided with hotels and lodging-houses. Its beach is composed of beautiful yellow shingle. With these and other recommendations, Ventnor has risen into importance within the last 30 years. Pop. '61, 3,208; '71, 4,841.

VENTRICULITES, a genus of fossil sponges, specimens of which are of frequent occurrence in cretaceous strata. They often form the nucleus around which flints are aggregated, and give their form to the flint nodules. Indeed, it is believed by some that the flints are the metamorphosed remains of this genus, and other silicious sponges. Ventriculites are sessile, and cup-shaped, gradually opening from the base upward. Twelve species have been observed.

VENTRILOQUISM, the art of producing tones and words without any motion of the mouth, and so that the hearer is induced to refer the sound to some other place. It does not depend on any peculiar structure of the organs of the voice, but upon practice and dexterity. The name is founded upon the mistaken supposition that the voice proceeds from the belly. The art of the ventriloquist consists mainly in taking a deep inhalation of breath, and then allowing it to escape slowly; the sounds of the voice being modified and muffled by means of the muscles of the upper part of the throat and of the palate. The ventriloquist avails himself at the same time of means such as are employed by sleight-of-hand performers to mislead the attention. Ventriloquism is a very ancient art; and is mentioned by Isaiah (xxix. 4). The Greeks ascribed it to the operation of demons, and called ventriloquists *engastrimanteis* (belly-seers), and also *Euryklytes* from Eurykles, a professor of the art at Athens. In modern times a Frenchman of the name of Alexandre obtained great reputation for his mimetic representations, combined with ventriloquism and sleight-of-hand; and in England, Love was long one of the most popular ventriloquists.

VENTURA, a co. in s. California, having the Pacific ocean for its s. boundary; about 2,000 sq. m.; pop. '80, 5,073—4,153 of American birth, 223 colored. Co. seat, San Buenaventura.

VENTURA DE RAULICA, GIOACCHINO, 1792–1861; b. Palermo; left the society of Jesuits and joined the order of Theatines; soon distinguished himself by pulpit eloquence; became general secretary of his order; subsequently censor of the press and member of the royal council of public instruction for the kingdom of Naples; distinguished himself by his funeral orations, one of which, on Pius VII., passed through 20 editions, and gained for him the name of the Italian Bossuet; was appointed general of the order of the Theatines, 1824; resided at Rome, and elected professor of law in the Roman university; published, 1828, *De Methodo Philosophandi*, which was severely attacked by his friend the abbé Lamennais. Leaving the pontifical court, he spent 10 years studying especially the Scriptures and the Christian fathers. In 1848 he was made minister plenipotentiary to the court of Rome by the popular government of Sicily; May 4, 1849, retired to Civita Vecchia. Afterward he went to Paris, where his eloquent preaching drew immense crowds. Here he published *Les femmes de l'Evangile; La raison philosophique et la raison Catholique; Essai sur l'origine des idées; Le pouvoir Chrétien*.

VENUE is the locality assigned in pleadings in English actions at law for the acts or circumstances out of which the action arises. The rule is, that the declaration or plaintiff's pleading must set forth some venue, which is usually the county where the cause of action arose; and this shows where the trial will take place, if at all. If the other party shows that it would be more convenient and less expensive to try the action elsewhere, then he may apply to the court, or a judge, to change the venue, and thus the trial may take place in a different county from that first stated.

VENUS, the Roman goddess of love, subsequently identified with the Greek Aphrodite (q.v.). Originally, she does not seem to have occupied a conspicuous place in the Latin religion, and scarcely, if at all, figures in the history of Rome under the kings; a circumstance that throws no inconsiderable light on the Roman character, for it may be

taken as an indication of the grave and serious disposition of the people, who highly valued matrimony and wedded joys, but cared little for the sentimental passion of love. Gradually, however, as the myth of the Trojan origin of Rome gained ground, the worship of Venus emerged into importance. Aphrodite was the mother of Æneas, and Aphrodite became Venus; Ares was Mars, and Mars was the national god of the Roman people; and as in the Greek mythology, Aphrodite was beloved of Ares, so, of course, Venus was represented as the paramour of Mars, and thus was advanced by the poets to the dignity of the divine mother of the Roman people. Several temples were erected to her in Rome at different times and under different names, and rites were celebrated in her honor during the month of April—the spring-time of the year being thought favorable to the growth of tender emotions.

The figure of Venus was a favorite subject of ancient sculptors. One of the most famous specimens extant is the "Venus de' Medici," preserved in the Uffizi gallery at Florence, and generally admitted to be the finest relic of ancient art. It was dug up in several pieces, either at the villa of Hadrian, near Tivoli, or at the portico of Octavia, in Rome, in the 17th c.; and after remaining for some time in the Medici palace in Rome (whence its name), was carried to Florence by Cosmo III. about 1680. It is a nude statue, 4 ft. 11½ in. in height, without the plinth; and from the exquisite symmetry and grace of the figure, it has become a sort of standard of excellence for the female form. The sculptor was Cleomenes, the Athenian (200 B.C.). The beautiful "Venus of Milo," now in the Louvre at Paris, is so called because it was found in the island of Milo or Melos in the Archipelago. Of modern statues that by Canova is the most famous.

VENUS (PLANETS, *ante*), an inferior planet whose orbit is between that of the earth and Mercury. Her mean distance from the sun is 66,154,000 miles. The eccentricity of her orbit is only 0.00686, and her greatest distance, 66,586,000 m., only exceeds her least distance by 904,000 miles. She performs her sidereal revolution in 224.7 days, in an orbit whose plane is inclined 3° 23½' to that of the ecliptic, but her synodical revolution requires much more time, 583.92 days. Between inferior conjunctions and the next superior conjunction Venus is the morning star, and between superior conjunctions and the next inferior conjunction, she is the evening star. Her diameter is about 7,500 m.; so that her volume is about $\frac{1}{17}$ of that of the earth, and her mass is nearly $\frac{1}{25}$ of that of the earth (more correctly $\frac{1}{27.5}$). The great inclination of the equator of Venus to the plane of her orbit, about 50° (by some estimated to be more), and the great amount of solar heat received—about twice as much as is received by the earth—it is believed totally unfits her for human or perhaps any but the lowest animal life. A dense, cloudy atmosphere is believed to envelop her, but observations indicate that there are lofty mountains rising from her surface to a height of 20 miles. Venus, like Mercury, crosses the face of the sun, as seen from the earth, but her transits are not as frequent. They, however, possess more importance, because, from being nearer, her position on the sun's disk varies much with different points of observation, thus allowing of a method of angular measurement of her distance.

VENUS. See **VENERIDE.**

VENUSBERG, the name of several mountains in Germany, especially in Swabia; it appears to be met with in Italy also. It occurs for the first time, so far as is known, in a poem called the *Children of Limburg*, composed in the Netherlands about 1337 (published by Van den Bergh, Leyden, 1846); but since then it is met with frequently in the literature of the 15th and 16th centuries, and has been preserved to the present day in legends and popular songs. According to these accounts the lady Venus holds her court in the interior of such mountains, in brilliant style, with song and dance, banquets, and all kinds of revels. Persons of earthly mold now and then visit her abode (they are always represented as *descending*), and tarry longer or shorter time, some even to the day of judgment, leading a life of perpetual delight; e.g., Heinrich von Limburg, a hero of the above-mentioned romance, and the noble Tannhäuser (q.v.). Yet they usually run the risk of eternal perdition; and, therefore, the faithful Eckhart sits before the entrance of the mountain, and warns people against entering. Nor does the condition of the sojourners always present so enticing an aspect; on the contrary, there are at times heard issuing from the mountain the lamentations of the damned; and Geiler von Keisersberg makes the witches in their night-expeditions rendezvous in the Venusberg. On putting together the various traits of these traditions it is apparent that they originated in the mythology of the highest German antiquity. The lady Venus is, under a name borrowed from the classical mythology, the universal divine mother of the old German belief, in her peculiar conception of subterranean goddess—the same being that appears under several other German names, each bringing forward some particular side of her character; e.g., Hilda (q.v.), the gracious, benign; Hilda, war; Berehta (q.v.), the shining; Hel, the concealed (from which our hell is derived). In this character of goddess of the under-world she is surrounded by the elves and other subterranean spirits, unbaptized children, fallen heroes, and the wise women devoted to her services, who, in the way of thinking of later times, were degraded to witches. The queen of Elfland, or Faery, is evidently only another form of the lady Venus modified by a more decided mixture of Celtic and classic elements.—See Tale of Tamlane, and Thomas the Rhymer in *Minstrelsy of the Scottish Border*.

VENUS'S FLOWER-BASKET. See ZOOPHYTE.

VENUS'S FLY-TRAP. See DIONÆA.

VENUS'S LOOKING-GLASS, *Specularia speculum*, a very pretty little annual, of the natural order *campanulaceæ*, which has long been a favorite in flower-gardens, and it is a native of corn-fields in the s. of Europe. It has brilliant blue, white, or violet-colored flowers, which fold up in a pentagonal manner toward evening.

VERA CRUZ, a maritime state of Mexico, consisting of a belt of territory about 500 m. long by 80 broad, stretching along the s.w. of the gulf of Mexico; 27,595 sq.m.; pop. '73, 459,262, chiefly creoles and Indians. The coast region, a strip about 30 m. wide, is low, level, and sandy, its most characteristic feature being its lagoons, of which the largest, Yamiago, is 60 m. long by 20 in breadth; while its rivers are much obstructed by bars. Its climate is hot and unhealthy, yellow fever prevailing from May to November. The interior slopes upward to the volcanic mountain range of the Sierra Madre by which it is traversed, culminating in the peak of Orizaba, 17,176 ft. high. It presents all varieties of climate from tropical to arctic, and a corresponding variety of vegetable products both of torrid and temperate zones. The middle region is fertile, and covered with magnificent forests and plantations of sugar, coffee, tobacco, corn, etc., and is agreeable and healthy. Among the mineral products are gold, copper, iron, and lead.

VERA CRUZ, or **VILLA NUEVA DE LA VERA CRUZ** (the New City of the Real Cross), an important city on the e. coast of Mexico, about 200 m. e. of the city of Mexico, with a pop. of about 15,000, composed of a motley collection from many nations. The city is built in a semicircle facing the sea, and is regularly laid out; the streets, which are wider than is usual in tropical countries, running e. and w. from the harbor, with others crossing them at right angles. The town is well defended by a strong wall and other substantial works, as also by the castle of St. Juan de Ulloa, which stands upon an island of the same name, about half a mile from the shore. The principal buildings are the cathedral, and about 15 other churches, generally built in the Moorish style, only 6 of which are in use; several monasteries; the court-house and prison, which stand on one side of the great square in the center of the city. The houses and public buildings are generally built of rubble masonry, formed of small stones, interspersed with red tiles, the whole being afterward covered with good durable plaster, and colored with a variety of tints; and, as most of the houses are in the old Spanish style, with open arcades, balconies, galleries, etc., the city presents a very picturesque aspect. There are a few good hospitals. The drainage of the city flows down open channels in the center of the streets, which are almost on a level with the sea. This, combined with the wretched water which the inhabitants are compelled to use, the marshy and utterly barren nature of the surrounding country, and the pestilential nature of the climate generally, easily accounts for the frightful ravages of yellow and other fevers. Yellow fever is most prevalent from May till November. Although it is the chief port for all Mexico, Vera Cruz has no harbor, but only an open roadstead between the town and the castle. The anchorage is exceedingly bad, and when the n. gales, or *nortes* (terrible hurricanes, bearing along with them clouds of sand from the sand-hills behind the town), prevail, many vessels are wrecked on the adjoining shore. A railway between this city and Mexico was begun in 1864, and completed in 1869; tramways for covered cars have also been laid down through the principal street to the railway station, a distance of $2\frac{1}{2}$ miles.

The chief exports are the precious metals, cochineal, sugar, flour, indigo, provisions, sarsaparilla, leather, vanilla, jalap, soap, logwood, and pimento; and the imports, cotton, woolen, linen, and silk goods, brandy, iron, steel, wax, quicksilver, paper, hardware and cutlery, earthenware, etc. The exports from Vera Cruz have a value of above \$3,000,000 annually; the value of the imports is considerably less.—**OLD VERA CRUZ**, a village to the n., was the first Spanish settlement on the coast.

VERATRIA ($C_6H_{12}N_2O_{16}$), an alkaloid occurring in cevadilla (the dried fruit of *asagraa officinalis*), in the bulbs of *colchicum autumnale*, and in the roots and seeds of different species of *veratrum*. Cevadilla is the source from which it is most readily obtained; and for the method of extracting it we must refer to the pharmacopœia. In a state of purity, it is a pale, gray, amorphous powder, without smell; but even in the most minute quantity, powerfully irritating to the nostrils, sometimes producing dangerous fits of sneezing. It is strongly and persistently bitter, and highly acrid; insoluble in water, sparingly soluble in spirit and ether, but readily in diluted acids. Heated with access of air, it melts into a yellow liquid, and at length burns away, leaving no residue. In France it is much used as an internal remedy for pneumonia and acute rheumatism, and for the latter its efficacy is well established. It is given in the form of pills, containing $\frac{1}{4}$ of a grain, of which three may at first be given daily, and the number increased up to eight or ten, unless pain in the throat or stomach, vomiting, or diarrhea supervene, when their use must be suspended till these symptoms disappear. In this country it is chiefly employed externally in the form of "ointment of veratria" for neuralgic affections, and for scrofulous diseases of the joints. It is an extremely acrid and violent poison, and must be prescribed with great care.

VERA'TRUM. See HELLEBORE.

VERAZZA'NO, GIOVANNI DA, 1480-1527; b. Italy; of a noble family; in the service of Francis I. of France sailed on a voyage of discovery to North America in 1524. He went by way of Madeira, in command of the frigate *Dauphin*, and after weathering a great storm reached the e. coast of North America, and sailed along it from the 34th degree of latitude to Newfoundland. He discovered the continent at cape Fear or New Jersey, and is supposed to have discovered New York bay. The genuineness of a letter to Francis I., giving an account of his discoveries, has been questioned. He is said to have been put to death in Spain for piracy.

VERB (Lat. *verbum*, a word), the name given in grammar to that part of speech (see PARTS OF SPEECH) which predicates or affirms. See SENTENCE. As the very end of speaking is to assert or affirm something with a view to being believed or disbelieved, the part of speech which performs this office is, as it were, the soul of the sentence, and is called "the word," or verb, par excellence. Verbs affirm either some action or some state; as, "John *reads*," "the sun *shines*," "the book *lies* on the table." When the nature of the action requires an object to complete the sense, the verb is called *transitive*, because the action *passes over* (Lat. *transit*) to an object; as, "the child *strikes* the dog." Some verbs complete the conception of the action in themselves, and require no complement; as, "the child *sleeps*," "the bird *flies*." These are called *intransitive*. A distinction is attempted to be made between intransitive verbs expressing action (as *flies*, *moves*), and verbs expressing merely a state (as *sleeps*, *lies*), the latter being called *neuter* verbs. But it is often impossible to draw the line where activity ends and neutrality begins. Even in such a verb as *sleeps*, it is implied that the sleeper shows certain outward manifestations that make an impression, or act, on the beholder; when we affirm that an object *stands*, *lies*, or even only *exists*, or *is*, we in fact affirm that it "acts," in this sense. All verbs, then, agree in affirming action.

Nor can any exact or permanent division be made of verbs into transitive and intransitive. We can say whether a given verb in a particular sentence is used transitively or intransitively; but not that it is absolutely, and in itself, transitive or intransitive. It would be difficult, perhaps, to find a verb that cannot be shown to be both the one and the other. "The child *sees* the candle" is unquestionably an instance of a transitive verb; in, "the newborn child *sees*, but the puppy is blind," the same verb is unquestionably intransitive. A verb used transitively has reference to particular acts; when the action is to be *generalized*, all specification of an object is dropped, and the verb becomes intransitive. Ex., "men *build* houses" (trans.); "men *build*, and time pulls down" (intrans.).

Intransitive verbs generally express a kind of action that we think of, at least, as composed of a number of parts, all like each other; as, he *walks*, *runs*. Now, with regard to the particular parts, we generally find that the same verb takes an object after it; as, "he walks *a step*, *a mile*, *a long way*," "John played *a stroke*, *a piece*, *a game*;" "he did not sleep *a wink*" (sleep being a prolonged winking). That any intransitive verb can take its cognate noun as an object, is a received doctrine. Ex., "he *ran* a *race*;" "they *died* an *easy death*."

There are two classes of transitive and intransitive verbs, related to each other, in the following way:

Intransitive.	Transitive.	
he sits.	he sets	(causes to sit).
" lies.	" lays	(" " lie).
" falls.	" fells	(" " fall).
" rises.	" raises	(" " rise).
" sucks.	" soaks	(" " suck).
" drinks.	" drenches	(" " drink).
" dives.	" dips	(" " dive).

Those in the second column are called *causative* verbs. In the ancient forms of our language there were many more such causative verbs, formed from root-verbs by a change, generally of the vowel. In Hebrew every verb is capable of assuming the causative form. Modern English does not stand much on forms, but employs almost any verb in a causative sense without change of any kind. Thus, "The horse *walked*"—"the groom *walked* the horse;" the wood *floats*"—"raftsmen *float* the wood down the stream."

Passive Form, or Voice, of Verbs.—Instead of "Cæsar *defeated* Pompey," we may say, "Pompey *was defeated* by Cæsar." In the former, the verb is in the *active voice*; in the latter, in the *passive voice*. In using the passive voice, the thing or person acted upon is made the subject of the sentence, and has the chief attention directed thereto; with the active voice, the doer and his action are more prominent. Of course it is only transitive verbs that can thus have a passive voice.

One class of intransitive verbs become transitive by the addition of one of the class of words called prepositions; as, *speak*—*speak to*; *fall*—*fall upon*. Some verbs already transitive take prepositions simply to modify the sense; as, *set*—*set up*, *break*—*break down*. In such cases, the verb and preposition are to be considered as forming one compound verb, and might be written with a hyphen—*speak-to*, *break-down*. With the

addition of a preposition, what was an intransitive verb becomes capable of being used in the passive voice. Thus, "the king spoke to the duke about it"—"the duke was spoken to about it by the king." "Robbers fell upon him"—"he was fallen upon by robbers."

Not, however, in all cases. For, "the Thames runs into the sea," we could not say, "the sea is run into by the Thames." And yet, with this same verb, we can say, "the mail-train was run into by the express." The distinction seems to be that when we think of the object as sensibly affected by the action, and wish to call the chief attention to the effect so produced, the object may become the subject, and the verb be passive.

VERBENA CÆ, a natural order of exogenous plants, consisting chiefly of trees and shrubs, but partly also of herbaceous plants. The leaves are generally opposite and simple, and have no stipules. The flowers are generally in corymbs or spikes; the calyx is tubular, persistent, inferior; the corolla hypogynous, tubular, its limb usually irregular; the stamens generally four, two long and two short, sometimes equal, sometimes only two; the ovary 2 to 4 celled, the style solitary, terminal; the fruit composed of 2 to 4 achenia united, sometimes fleshy; the seeds 1 to 4. The order contains almost 800 known species, chiefly tropical, some of them natives of temperate countries. The verbenaceæ are allied to *labiate* both in botanical characters and in properties, but the leaves have no oil-glands. Some are beautiful ornaments of flower-gardens and hot-houses; some are highly esteemed for their fragrance; some are used in medicine, as vervain (q.v.), etc., although no medicinal plant of much value belongs to the order; the fruit of some species, as *prema esculenta* and species of *lantana*, is eaten; the leaves of *stachytarpheta jamaicensis* are used as a substitute for tea; and the timber of a number of species is valuable. To this order belongs the teak (q.v.) of India.

VERBOECK HOVEN, EUGENE JOSEPH, b. Warneton, West Flanders, 1799; a Belgian animal-painter of repute, several of whose works are in the United States. Among these may be cited his "Herd of Sheep overtaken by a Storm," "Horses attacked by Wolves," "Herd of cattle in the Roman Campagna." He is further known by his etchings.

VERCELLI, a venerable city of northern Italy, in the province of Novara, stands in a fertile plain, on the right bank of the Sesia, 44 m. w.s.w. of Milan by railway. It covers a wide area, is surrounded by boulevards—those on the n.w. side commanding a magnificent view of the Alps—is the seat of a bishop, and has the appearance of great prosperity. The cathedral, an edifice of about the middle of the 16th c., has a library containing a collection of ancient and valuable MSS. Vercelli is a thriving commercial city. Pop. '72, 20,640.

VERCHÈRES, a co. in s.w. Quebec, having the St. Lawrence river on the w. and n., and on the e. the river Richelieu; 78 sq. m.; pop. '71, 12,717. Capital, Verchères.

VERDE-ANTIQUE, a beautiful stone of a dark green color, with patches of white, and sometimes also black and red. It is a kind of hard breccia, and was much prized by the ancient Romans, and is still in great favor in Italy.

VERDEN, a t. of Prussia, once capital of a duchy, in Hanover, on the right bank of the Aller, here crossed by a bridge, and on the railway to Hanover, from which it is distant n.n.w. 42 miles. Pop. '75, 7,669.

VERDI, GIUSEPPE, the only living operatic composer of any note in Italy. He was born in 1814 at Roncole, in the duchy of Parma, where his father was an innkeeper, and he received his musical education at Milan. His first work was a musical drama called *Oberto di San Bonifazio*, which appeared in 1839; and he has since produced a number of operas, including *I Lombardi*, *Ernani*, *I due Foscari*, *Attila*, *Macbeth*, *Rigoletto*, *Il Trovatore*, *La Traviata*, *Un Ballo in Maschera*, *Aida*, and in 1878, *Montezuma*. Verdi's operas, while they abound in taking melody, and in striking dramatic effects, are characterized by noisy orchestration. In 1861, he was elected to the Italian parliament, and in 1874 was made a senator: while in 1875 he was nominated a commander of the French legion of honor, of which he was already a member. He is a member of many artistic societies, and has been decorated by the emperor of Russia and the khedive of Egypt.

VERDICT, in law, is the finding of a jury as to the issue of fact raised between the parties. The usual verdict in criminal cases is guilty or not guilty; in civil cases, it is a verdict for the plaintiff or for the defendant, according to the fact. These are called general verdicts. In some civil cases, the jury, when doubtful, or when the court directing them is doubtful how the law ought to be applied to the facts, find a special verdict, i.e., specific facts, leaving the court to draw the proper conclusion. A verdict by a jury is usually conclusive in all criminal cases, and no new trial can be had; but in civil cases, the party defeated may, within a certain number of days allowed by the practice of the court, move to set the verdict aside, and apply for a new trial on various grounds; as, for example, that the judge misdirected or misled the jury; that the verdict was against the weight of evidence, or was perverse; that the damages were too great, or too small, etc. See NOT PROVEN.

VERDIGRIS is the popular name for diacetate of copper ($2\text{CuO}, \text{C}_4\text{H}_3\text{O}_3 + 6\text{Aq.}$), a substance which is largely used for commercial purposes, and as an external application

in surgery. It is prepared on a large scale by piling up copper-plates with alternate layers of mare or fermenting grape-skins. In the course of a few weeks, the surface of the copper is covered with a crust of the salt, which is detached, made into a thick paste with vinegar, and pressed into molds. The salt thus obtained is in the form of a bluish-green tough mass, which is not easily pulverized. The formation of the salt by this process is due to the alcohol in the grape-skins being slowly oxidized into acetic acid, while the copper absorbs oxygen from the air, and the oxide thus formed unites with the acetic acid. Verdigris may be obtained more directly by placing the copper sheets in cloths dipped in vinegar. Verdigris is permanent in the air; when heated, it first loses water, and then acetic acid, the residue being metallic copper. Water resolves it into an insoluble tribasic acetate, and a soluble subsesquiacetate of copper—a point which must be recollected in employing this salt. It is used by the surgeon as a caustic application to venereal warts and fungous growths; it is also a good application in ophthalmia tarsi, and has been of much service in stimulating old and indolent ulcers, in the ulcerated sore throat of scarlatina, and in malignant ulcer of the tongue. It may be used in the form of an ointment or a liniment. The latter, formerly known as *mel Egyptiacum*, is composed of 1 ounce of powdered verdigris, 7 ounces of vinegar, and 14 of honey. The verdigris is dissolved in the vinegar, and to the strained solution the honey is added, and the whole is boiled to a proper consistence. It should be applied with a camel-hair pencil.

Verdigris is an active irritant poison, but is much more commonly the source of accidental than intentional poisoning, it being often formed in copper vessels used for cooking, or in the very reprehensible practice of putting copper coins into pickles to give them a fine green color. If copper vessels for cooking are kept perfectly clean, they seem not to be dangerous, provided (1) no acid matter be placed in them; (2) that the boiled materials are at once poured out, and not allowed to stand to cool in them; and (3) that the vessels are always at once cleaned. But the interior of such vessels should always be tinned, care being frequently taken that the tinning remains entire. In cases of poisoning the best treatment consists in the free administration of white of eggs and milk.

VERDITER, a pigment which is extensively used in common painting. It is either blue or green, the latter being generally known as Bremen green. It is formed by a very complicated process from blue vitriol, or sulphate of copper, sea-salt, metallic copper, muriatic acid, caustic potash, and water, and occupies three months in its manufacture. The blue is most valued.

VERDOY, in heraldry, a term indicating that a bordure is charged with flowers, leaves, or vegetable charges. Thus, a bordure argent verdoy of oak-leaves proper is equivalent to a bordure argent, charged with eight oak-leaves proper.

VERDUN, a fortified t. of France, in the dep. of Meuse, stands on the right bank of the river of that name, about 150 miles (direct line) e.n.e. of Paris. It was fortified by Vauban, and its defenses consist of a wall with bastions and a citadel. It is the seat of a bishop, has a fine cathedral, and carries on various manufactures. In Nov. 1871, it was taken by the Germans, who thus established better communication between Germany and the troops before Paris. Pop. '76, 15,433.

VERE, Sir AUBREY HUNT DE, 1788-1846, an Irish baronet, author of two dramatic poems, *Julian the Apostate* and the *Duke of Mercia*, as also of *A song of Faith, and other Poems*.

VERE, AUBREY THOMAS DE.; b. Ireland, 1814; third son of sir Aubrey de Vere, educated at Trinity college, Dublin. Among his published works are *The Wildenses and other Poems* (1842); *The Search after Proserpine and other Poems* (1843); *English Misrule and Irish Misdeeds* (1848); a poem on the centenary of Daniel O'Connell (1875).

VERE, DE, a noble family of England, of which the most distinguished members were: JOHN, 1450-1513, 13th earl of Oxford, who fought as a Lancastrian in the "wars of the Roses," had a command under Henry VII. at Bosworth, and as lord high steward pronounced sentence on the earl of Warwick. EDWARD, 17th earl of Oxford, 1540-1604, an Elizabethan poet and wit of fashion; sat on the trials of the earls of Essex, Arundel, and Southampton, and that of Mary, queen of Scots, as lord high chamberlain; and held a command in the fleet sent out in 1588 against the Spanish Armada; AUBREY, 20th earl, who fought as a royalist in the rebellion, was lord lieutenant of Essex under Charles II., and was dismissed by James II. in 1687 for refusing to aid that monarch in his schemes.

VERGE, a mediæval term for a small shaft.

VERGENNES, a city in w. Vermont, in Addison co., incorporated, 1783; pop. '70, 1570. It is surrounded by picturesque mountain scenery; and is on Otter creek, navigable for vessels of 300 tons, which empties into lake Champlain 7 m. distant. The river is 500 ft. wide at this point, with a fall of 37 ft., furnishing extensive water power. It is 21 m. s. of Burlington on the Rutland branch of the Central Vermont railroad. It contains a U. S. arsenal, 5 churches, the state reform school for boys, a newspaper, an efficient fire department, and water-works. The leading industries are the manufacture of curtain rollers, guns, lumber, leather, flour, furniture, pumps, etc. It has regular

steamboat communication with the lake ports. The fleet with which MacDonough captured the British squadron in the war of 1812, was built at this place.

VERGENNES', CHARLES GRAVIER, Comte de, 1717-87; b. France; minister to the electorate of Treves in 1750. He was ambassador to Turkey, 1755-68; afterward to Sweden. He was made minister of foreign affairs by Louis XVI. in 1774, after taking an active part in bringing about the revolution in Sweden. During his administration were signed the treaty with the United States in 1778, with Austria in 1779, and with England, closing the revolutionary war, in 1783.

VERGER (Lat. *virga*, a wand), an officer of cathedral and collegiate churches, who carries the mace, whether before the dean or other chief dignitary, in procession, or on any other ceremonial occasion. The mace, however, has no sacred significance, but is simply an emblem of dignity.

VERGIL, POLYDORE, abt. 1470—abt. 1555; b. Urbino; a prolific author, his best known work being *Historia Anglica*, a history of England from the earliest times to the end of the reign of Henry VII. Sent to England as collector of Peter's pence (of which office he was the last holder), he remained in that country during the most of the remainder of his life, receiving successively the rectorship of Church-Langton, the archdeaconry of Wells, and prebends in the cathedrals of Hereford, Lincoln, and St. Paul's, London. After a residence of nearly 50 years in England he returned to end his days in his native land with permission to hold his archdeaconry, as also his Hereford prebend. His Latin style is admired for its neatness and lucidity.

VERGNIAUD, PIERRE VICTURNIEN, 1759-93; b. Limoges, France. He was the most eloquent member of the *Gironde*, and in 1791 was raised to the presidency of the legislative assembly, in which capacity it fell to him to pronounce sentence on the king. He was a keen opponent of Robespierre, and the Montagnards, and in 1793 was with the other prominent members of his party, brought before the revolutionary tribunal, and sentenced to death Oct. 30, which sentence was executed next day.

VERIFICATION, in law, a legal term used in pleading by a party setting forth that he stands ready to establish the truth of those facts to which he has pleaded, if they be such as amount to "new matter," the form being "and this he stands ready to verify." The practice of equity and of the civil codes of some states requires a plea to be verified by appended affidavit. In practice the term is sometimes used as synonymous with authentication, or the examination of the truth of a writing.

VERJUICE, a vinegar formerly much used, made from sour cider, or from the juice of the wild crab. The expressed juice of unripe grapes is another kind of verjuice used in the vine districts. Both are occasionally employed in cooking.

VERMEJO, an important affluent of the Paraguay (q.v.).

VERMÉS (Lat. worms), the name given by Linnaeus to one of the classes in his zoological system, in which he included all the lower invertebrate animals, whether of worm-like form or not. The study of their structure has since led to their arrangement in several distinct classes, and the Linnaean term is altogether disused.

VERMICELLI (Ital. little worms), a fine kind of macaroni (q.v.).

VERMICULATION, checkering or chaneeling formed in mason-work as an ornament, giving the appearance of being eaten by worms.

VERMIFUGES, **VERMICIDES**, or **ANTHELMINTICS**, are remedies which possess the property of destroying intestinal worms, or of expelling them from the digestive canal. The only worms whose presence in the intestinal canal is so common, that the remedies for their destruction and expulsion require special notice, are the two varieties of tapeworm known as *taenia solium* and *taenia mediocnollata*, or the *hooked* and the *hookless tapeworm* (q.v.), the *ascaris lumbricoides* or *large round worm*, and the *ascaris* or *oxyuris vermicularis*, or *small threadworm*. A few of this class of medicines are said to be useful in destroying all these kinds of worms—viz., the tapeworms, the round worms, and the threadworms. In this category, we may place *absinthium*, or *wormwood*, whose effects are doubtful; *sabadilla*, or *cevadilla*; *santonica*, or *worm-seed*, and its active principle, *santonin* (q.v.); and *oil of turpentine*. As in our notices of the different human entozoa, we have referred to this article for the appropriate treatment of each, we will commence, in consequence of its greater importance, with the remedies that have been recommended in tapeworm, ranging them according to the repute in which they stand. (1) The root of the male shield-fern (*aspidium filix mas*), of which the best preparation is the "liquid extract of fern-root" of the *Pharm. Br.* It may be taken in the morning before breakfast, in doses of about a scruple, in the form of an emulsion with yolk of egg, syrup of orange-peel, and water; and if the worm does not come away in six hours, a brisk purgative should be administered. Generally, however, it is expelled by a single dose, in the mass, and without pain or much uneasiness. (2) *Cusso* or *kousso*, the flowers of *brayera anthelmintica*, in doses of from half-an-ounce to an ounce of the flowers (infused for a quarter of an hour in ten ounces of lukewarm water and a little lemon-juice), or of

four ounces of the infusion of the *Pharm. Br.*, and following in four hours, if it has not acted, by a dose of castor oil, is a safe and very sure remedy. (3) Decoction of the bark of the root of the pomegranate tree (*granati radix*). (4) Oil of turpentine (q.v.); and besides these, which are the best remedies, the seeds of the common pumpkin (*cucurbita pepo*); kamela, the powder adhering to the capsules of *rotteria tinctoria*; santonine, etc., have found their advocates. All these medicines should be taken fasting, or after a light supper on the previous evening.

Foremost among the remedies for *ascaris lumbricoides*, Dr. Cobbold places *santonine* (q.v.); but kamela is also very efficacious in doses of from one to two drams every four hours. Dr. Waring in his *Materia Medica* gives a long list of remedies employed with success in the east, but unknown in this country. *Ascaris vermicularis*, or the *threadworm*, is more successfully attacked locally in the rectum by injection, than by medicines administered in the ordinary method. Among the best forms of enemata are half a dram of tincture of sesquichloride of iron in a little gruel, retained in the bowel as long as possible, or injections of salt and water, or of infusion of quassia. As an internal remedy, *santonine* is the best. The most annoying symptom occasioned by these worms is the intense itching about the lower part of the bowel, especially in the evening and at night, is best relieved by the introduction of a little mercurial ointment within the verge of the anus when the patient retires to rest.

VERMIGLI, PIETRO MARTIRE (PETER MARTYR), 1500-62; b. Florence; an Italian ecclesiastic of the order of St. Augustine, whom intercourse with Valdes, a Spanish convert, and study of the works of Zwingli, Melancthon, etc., induced to adopt the views of the reformers. Having avowed his conversion at Luca, he was necessitated to flee thence to Switzerland, whence he passed to Strasbourg, in whose university he received the chair of divinity. Invited by Cranmer to England he was, in 1547, appointed by Edward VI. lecturer on the Scriptures at Oxford. Driven from England by the Marian persecution he resumed his chair of divinity at Strasbourg, assuming also that of Aristotelian philosophy, both which he held till 1556, when he became professor of theology at Zurich. In 1561 he attended the celebrated conference of Protestant divines at Poissy, France, and died next year, much regretted, at Zurich. He was one of the most learned and most tolerant of the reformed communion. His works were published in English in 1583 under the title of the *Commonplaces of the most Famous and Renowned Divine, Doctor Peter Martyr*, dedicated to queen Elizabeth.

VERMILION, or artificial cinnabar (q.v.), is a bisulphide of mercury, formed by mixing 100 parts of the metal with 16 parts of sulphur, and subliming them in properly constructed retorts; the result is a heavy dull red cake, an inch or so in thickness, of acicular crystalline texture, and exactly resembling in these respects the native cinnabar. When, however, it is finely powdered, it acquires the beautiful bright red color so well known in this pigment. The finest European vermilion was, until lately, made at Utrecht in Holland, and this manufactory supplied nearly all Europe. It is now, however, manufactured in other places, particularly in Istria. A new process, invented by Kirchehoff, has also been introduced, and is employed in most manufactories for making the finest quality. It is called the humid process, from the employment of water, with which the ingredients are triturated at a temperature of not more than 130° Fahr., until the mixture, which is first black, turns a brownish-red, when the temperature is lowered to 114° Fahr., and steadily maintained at that until the brightest color is obtained; it is then allowed to subside, the liquid is decanted off, and the residue washed in clean water. The Chinese have always been famous for the extreme beauty of their vermilion.

VERMILION, a co. in e. Illinois, having the state line of Indiana for its e. boundary; 900 sq.m.; pop. '80, 41,601—38,605 of American birth, 201 colored. Co. seat, Danville.

VERMILLION, a co. in w. Indiana, having the Wabash river for its e. boundary; 275 sq.m.; pop. '80, 12,025—11,823 of American birth, 74 colored. Co. seat, Newport.

VERMILLION, a parish in s. Louisiana, having the gulf of Mexico on the s. and Vermilion bay on the s.e., containing lake Mermentau; 600 sq.m.; pop. 80, 8,735—8,589 of American birth, 1956 colored. Co. seat, Abbeville.

VERMILYEE, THOMAS EDWARD, D.D., LL.D., b. New York, 1803; studied at Yale college and Princeton theological seminary, but without graduating; ordained by the presbytery of New York; pastor of the Presbyterian church, Vandewater street, New York; of the Congregational church, West Springfield, Mass., 1829-34; of a Reformed church, Albany, N. Y., 1834-39; became pastor of the collegiate Reformed church, New York. He has published *Address* before the St. Nicholas society of New York; *A Discourse* on the rev. Dr. Dewitt before the New York historical society; a bicentennial discourse in commemoration of the founding of the West Springfield church, March 25, 1874.

VERMIN (Lat. *vermis*, a worm), a term commonly applied to small noxious animals, particularly to those which, unless their increase is checked, are apt to become excessively numerous. Of some of the applications of this term, as to parasitic insects, it is

unnecessary to say anything; but it seems proper to notice the use made of it by farmers and gardeners, with reference to quadrupeds and birds injurious to their crops, and by gamekeepers with reference to those which are destructive to game. In the estimation of the gamekeeper all those animals are vermin which are known ever to prey upon any kind of game, or to rob the nests of game-birds. He therefore wages unceasing war against foxes, polecats, weasels, stoats, hedgehogs, hawks, falcons, ravens, carrion-crows, magpies, and even owls. The results are not agreeable to the farmer, as, the balance of nature being thus interfered with, animals destructive to his crops multiply without restraint, particularly rats, mice, and voles. The farmer is apt to regard some kind of game themselves as vermin, especially hares (and rabbits), which, when numerous, cause him great loss. As to these, probably, there might be ready enough means found of reducing their numbers, if it were permitted, even although an undiminished assiduity should be maintained in keeping down all animals of prey. It is otherwise, however, as to the smaller quadrupeds already named, and the destruction of their natural enemies is followed by their excessive multiplication. Beasts and birds of prey have their use in the economy of nature. The larger beasts, which are dangerous to man himself, or destructive of the animals valued by him as his property, are no longer of use in thickly-peopled and extensively cultivated countries; their extirpation is therefore to be desired, and they rapidly disappear before advancing civilization; but their use in a different state of things may be seen, if we reflect on the vast multitudes of antelopes and other herbivorous animals in the wilds of Africa, which would soon cease to find sustenance for themselves but for these destroyers. Kites, kestrels, owls, weasels, and hedgehogs are particularly useful to the British farmer, as preying upon the mice and voles, which are often extremely destructive to his crops, eating whole rows of seed-wheat and beans, proceeding from one end of the row to the other; and all the injury done to him by game, or at least by feathered game, is generally little in comparison with that which results from the continual shooting and trapping of them by gamekeepers. No expedient is known so likely to rid the fields of mice and other such pests, as to put a stop to the destruction of the quadrupeds and birds which prey upon them. The farmer himself, however, sometimes falls into the error of seeking to interfere unduly with the balance of nature—complaining of rooks as a mere nuisance, and demanding the destruction of rookeries. The money which he expends in guarding his fields from rooks at certain seasons, when they are apt to injure his crops, is more than repaid by their services at other times in the destruction of grubs. Wood-pigeons, which have of late become extremely numerous in some parts of Britain, do more harm to the farmer than any other vermin, as they feed chiefly on grains, seeds, young clover, etc., and are very voracious; their ravages are becoming a serious consideration to farmer and landlord alike, and they are therefore justly regarded in the light of true farm-pests. Small birds, such as feed both on insects and seeds, are, like rooks, not to be regarded as vermin. They consume, it is true, a certain portion of the grain, but they are of incalculable use in devouring those insects which are the worst of all destroyers of crops. The consequences which have ensued from the great reduction of the numbers of small birds in France, where they are eagerly sought for the table, should act as a warning to the farmers of all other countries. The most intelligent agriculturists of France are now extremely anxious for the increase of the numbers of small birds, as their only protection against caterpillars and grubs of many kinds. To give a premium for the destruction of sparrows, as is sometimes done in England, is bad policy, unless peculiar local circumstances have led to their extraordinary multiplication.

Moles are among the animals commonly regarded as vermin by farmers and gardeners; and in gardens they are certainly a pest; but it is probable that many pastures owe much of their long-continued fertility to the incessant stirring of the soil by moles; and when they are not excessively numerous, it may be better to undertake the labor of scattering the mole-hills, than to attempt the destruction of the creatures which throw them up.

Even rats and mice, although often among the most troublesome of vermin, are not, in all circumstances, to be regarded as mere pests. They are so, it is true, in fields, in houses, and in ships; but much of the refuse of towns would probably become far more offensive and injurious than it is, if it were left to putrefy, and the rats, which frequent the most filthy places, render valuable service by devouring it. Police regulations may be imagined, which, if strictly enforced, would render the presence of rats no longer desirable; but in this case, their numbers would probably soon diminish with the diminution of their supply of food.

Some of the means used for the destruction of vermin may be briefly noticed. Besides the use of cats for catching mice and rats, and of dogs, particularly terriers, to kill rats, the principal means employed are traps and poison. Of traps for rats and mice, there is great variety. The common wire spring trap for mice, baited with cheese or scorched oatmeal, which catches them by the neck and chokes them, on their biting through a thread, in order to reach the bait, is probably the best, and is too well known to need description. The stamp spring-trap in general use for rats is equally well known, but is liable to the objection that cats, or even dogs, may be caught in it, and have their legs broken, or be otherwise injured, when it is placed in situations to which they have access. Rats also learn to apprehend danger, and avoid the trap; their sense of smell

probably guiding them, which is very acute, and apprises them of the touch of human hands. To overcome this difficulty, oil of aniseed, or oil of caraway, is often used, which seems to render the bait more attractive, at the same time that it hides the warning smell. Professional rat-catchers ascribe especial value to oil of rhodium, but it is more expensive than the oils already named. The poison most commonly used is the white oxide of arsenic, which, however, must be used with great caution, so that only the creatures for which it is intended may get at it. Pieces of bread and butter sprinkled with sugar are laid down for a day or two, and then bread and butter sprinkled with arsenic; some of the oils which have been mentioned being at the same time employed. A better mode of poisoning rats is by a preparation devised by Dr. Ure, which is fatal to them, but scarcely dangerous to other animals. Hog's lard is melted in a bottle plunged in water at a temperature of 150° Fahr., and an ounce of phosphorus is added to every pound of lard, with a quantity of proof-spirit, to aid the mixture of the lard and phosphorus, which, when cooled, form a white mass, the spirit separating from it, so as to be fit for use again. This compound, very gently warmed, and mixed with flour and sugar, may be made into pellets, flavored with some of the attractive oils, and laid down near rat-holes. It is also used with advantage for field-mice, small pellets being scattered where they are very abundant. It is safer for this purpose than *nux vomica*, which is sometimes used, and more effectual than the powder of hellebore, and staves-acre seeds.

In farm yards, the precaution of placing ricks on frames or supports which mice cannot climb, is of great importance, as mice, when they get into a rick of corn, soon multiply excessively, and effect great destruction. No sticks should be allowed to rest against ricks. Corn in stacks may be secured from mice by building them on stone saddles, with an overhanging ledge, or on iron saddles, the smoothness of the iron preventing mice and rats from climbing.

The method employed with great success for destroying the field-vole, or short-tailed field mouse, by digging pits, is noticed in the article *VOLE*.

Rats may be destroyed in great numbers in a barn, if it can be made nearly air-tight, by placing in it a number of chafing-dishes, filled with lighted charcoal, strewing over them bits of broken stick-brimstone; after which the barn must be quit as quickly as possible, the door closed, and so left for two days. When the door is opened again, numerous rats will be found lying dead. Another method is that of spreading the floor with caustic potash, which, adhering to the rats' feet, is licked off. The result is obvious.

Where rats and mice are not very numerous, the trap is sufficient, but where they swarm, poison must be employed.

Rubbing the hands with a mixture of essential oils, before setting the trap, is enough to prevent the smell of the hands from being noticed by rats.

Traps for taking vermin either alive or dead have been invented by Mr. Miles, gardener at Roslyn house, Hampstead, and have been found, we believe, to answer well.

A very good box-trap used for rats, and polecats, etc., is open at both ends, the doors closing when the animal runs upon a bridge in the middle. Another and very simple kind of box-trap is used for rats, open only at one end, the bait placed near the other, and connected with a string, which, being loosed while the bait is being eaten, the door falls. This trap, however, can secure only one rat at a time.

Mixture of oils recommended for rats: oil of rhodium, 1 scruple; oil of caraway, 1 drachm; oil of lavender, 5 drops; oil of aniseed, 10 drops; tincture of musk, 2 drops.

A stamp-trap, such as is used for rats, is used also for foxes, wild-cats, etc.—the difference being merely in size.

VERMONT (Fr. *verd mont*, green mountain), one of the five New England states, and the first state received after the adoption of the federal constitution; lat. 42° 44'—45° n., and long. 71° 25'—73° 25' w.; bounded on the n. by Canada, on the e. by the Connecticut river, which separates it from New Hampshire; on the s. by Massachusetts; and on the w. by New York, from which it is separated for 100 m. by lake Champlain. It has an area of 10,212 sq. m., divided into 14 counties. The principal towns are Burlington, Montpelier (the capital), Rutland, Bennington, Windsor, St. Albans. The surface is rather hilly than mountainous, the Green mountains being rounded eminences 2,000 to 2,500 ft. high, bearing vegetation, and cultivated to their summits. The rivers are the Connecticut and its western branches, and the Onion, Lamoille, and smaller streams, affording abundant water-power, and falling into lake Champlain (q.v.). The state is studded with small lakes. The geological formation are the lower groups of azoic and silurian. East of the Green mountains is a bed of devonian limestone, 20 or 30 m. wide. Drift covers the whole state. Along the western part of the state, a great belt of quartz is covered by a bed of crystalline limestone 2,000 ft. thick. Slates are found on lake Champlain, with hematite iron, supplying several blast-furnaces. There are deposits of gold, pyritous copper ore, and at Rutland, rich quarries of statuary marble. Clay for white stoneware is found at Bennington, and there are several quarries of soapstone. The climate is cold, with long and severe winters, but healthful—the temperature ranging from = 17° to + 92°. The soil is a rich loam, and the country well wooded with hemlock, fir, spruce, oak, beech, sugar-maple, pine, hickory, elm, butternut, birch, cedar, etc.

The hills are well adapted for pasturage. The chief products are wool, cattle, maple-sugar, butter, cheese, hay, and potatoes. In 1870, farms, of the average size of 134 acres, occupied 4,528,804 acres; and the live stock in 1870 was valued at \$23,888,835. The state has some fine scenery, and beautiful waterfalls—as Bellows falls on the Connecticut, the Great falls of the Lamolille, falls of the Winooski, a fall of 70 ft. on the Missisquoi, etc. There are 799 m. of railway, two lines crossing the mountains. The chief business is agriculture; but there are 8 cotton-mills, 65 woolen-mills, and manufactures of lumber, machinery, leather, bar and pig iron, scales, etc. Vermont has 744 churches, or 1 to every 444 inhabitants; the university of Vermont, at Burlington, and 3 other colleges, with several theological and medical institutions, 41 academies, 3 normal schools, and 2,830 public schools. In 1878 the taxable property was worth \$303,202,-424. In 1870 there were 46 newspapers; in 1878, 66 periodicals. The governor, who holds office for two years, has a salary of £200; the state treasurer, £100; and the secretary of civil and military affairs, £55 a year. There are two houses of the legislature, elected by "every male citizen of peaceable behavior, 21 years old, and 1 year resident in the state." The first settlement in Vermont was in 1724, when it was claimed as a part of the New Hampshire grants. In 1763, it was claimed by New York, under grants of Charles II. to the duke of York. For ten years the New York officers were resisted, and sometimes tied to trees and whipped by the lawless settlers. These contests were stopped by the Revolution; but Vermont, a refuge for settlers from other states, remained 8 years out of the union. It was chiefly the Vermont militia that gained the victory of Plattsburg, on lake Champlain, in 1812; and the Green Mountain state contributed very largely to the union forces in the war of secession. The population, one seventh of which consists of persons of foreign birth, mostly from Ireland and Canada, with a very slight increase, owing to the large emigration to the western states, was in 1870, 330,551.

VERMONT (*ante*) was first settled by people from Massachusetts, who built fort Dummer near the site of Brattleborough in 1724. Many other settlers soon followed from Connecticut, and some of the southern towns that sprang up were chartered by Massachusetts. New York and New Hampshire, however, soon laid claim to the whole region, and there ensued much hostility between these colonies during several years. In 1776, when the Vermont settlers petitioned the provincial congress, then in session in Philadelphia, for admission into the confederacy, the people of New York opposed and caused them to be rejected. The following year the settlers declared their independence, framed a state constitution, and applied again to be admitted. Congress hesitated, though, as before, and the British generals engaged in subduing the revolution, seized the opportunity to endeavor to induce the people of the new state to declare allegiance to Great Britain. But they bravely refused to do so, and continued to wait until 1791, when their claims and rights were recognized. The original constitution was modeled on that of Pennsylvania, and is still known as "the constitution of Vermont adopted by the convention of 1793." The state, after its admission to the union, prospered for many years better than most of the other states, but during the past 30 years the population has remained nearly stationary. In 1870 the density of population was 32.37 persons to a sq. mile. There were 70,462 families, with an average of 4.69 persons to each, and 66,145 dwellings, with an average of 5 persons to each. Those engaged in agricultural pursuits numbered about 57,900, of whom 23,692 were laborers and 34,144 farmers; in professional and personal services, 21,000, including 591 clergymen, 9,588 domestic servants, 6,426 laborers, 72 lawyers, 569 physicians and surgeons, and 1895 teachers; in trade and transportation, 7,132; and in manufactures and mechanical and mining industries, 22,616. By the census, of 1880 the total population amounted to 332,236, showing an increase of only about 1700 in 10 years. The total number of farms in 1870 was 33,827; and in 1873 the chief products were 1,748,000 bushels of Indian corn, 399,000 of wheat, 60,000 of rye, 3,579,000 of oats, 97,000 of barley, 365,000 of buckwheat, 5,088,000 of Irish potatoes, 350,000 lbs. of tobacco, and 893,200 tons of hay. The live stock numbered 71,000 horses, 128,000 oxen and other cattle, 195,700 milch cows, 513,600 sheep, and 53,500 swine. In manufactures Vermont is far behind the other New England states, and by the census of 1870 ranked as the twenty-fifth in this respect in the union. The number of manufactories at that date was 3,270. These employed about 18,600 hands, had a capital of \$20,329,637, paid in wages \$6,264,581, used raw material valued at \$17,007,769, and produced annually goods worth \$32,184,606. The largest manufacturing interest was lumber, of which, planed and sawed and manufactured as sash, doors, and blinds, the annual product in 403 mills was \$6,186,660; of woolen goods in 43 establishments the value was \$3,550,962; of flouring-mill products in 81 mills the value was \$2,571,594. Other manufactories were 150 tanneries; 2 scales factories; 37 machine shops; 162 carriage and wagon factories; 28 cheese factories; and 47 manufactories of furniture. Considerable foreign commerce is carried on with Canada through Burlington, which is the port of entry of the United States customs-district for the state. For the year ending in June, 1875, the value of exports amounted to \$2,496,830, and of imports, \$2,631,748. This commerce is, for the most part, carried on by the way of lake Champlain and the Richelieu and St. John's rivers. The railroads in the state are chiefly trunk-roads, forming parts of the route between Quebec, Montreal, and New

York, or connecting with the Grand Trunk, the Boston, Portland, or White Mountain routes. The principal roads are the Connecticut and Passumpsic rivers, 123 m. in the state; the Rutland railroad, 120 m.; the Vermont Central, 193 m.; the Rensselaer and Saratoga, 33 m.; the Montpelier and Wells River, 38 m.; and portions of the Troy and Boston, Harlem Extension, and the New London Northern. The national banks of the state in 1875 numbered 46, with a paid-in capital of \$8,945,390, and an outstanding circulation amounting to \$7,178,581. There were also at that date 20 savings-banks, which had 27,677 depositors and deposits amounting to \$7,590,599; and 6 fire and 3 life insurance companies incorporated by the state.

The valuation of real estate in Vermont in 1875 was estimated to be \$81,106,760, which was stated to be about 40 per cent of the real value. The grand list of the state is 1 per cent of the valuation; and in 1873 the state tax was 35 per cent on the grand list of \$1,175,476. Adding the tax on gores and unorganized towns, and deducting for abatements and collection fees, the amount of the tax for that year was \$393,660. In Aug., 1879, the liabilities of the state amounted to \$206,136, of which \$135,500 consisted of an agricultural college fund due in 1891. The amount in the treasury at that time was \$68,750. The ordinary expenses paid during 1878 amounted to \$451,841.

Free public schools are maintained by means of state and local taxes and the income of a permanent school fund. There are state and town superintendents, and in the larger towns graded and high schools are sustained. The receipts for school purposes in 1876 were \$565,044, and the expenditures, \$565,044. The permanent school fund amounts to \$669,086. The school population in 1876 was 92,577 children, of whom 72,023 were enrolled, and 39,474 were reported in attendance. The number of schools was 2,519, and the average number of school weeks was 24. Among the higher institutions of the state are normal schools at Randolph, Johnson, and Castleton; Middlebury college (Congregational) at Middlebury; Norwich university (Protestant Episcopal) at Northfield; the university of Vermont (non-sectarian) at Burlington; the Vermont female college (Methodist Episcopal) at Montpelier; the state agricultural college at Burlington; and the Vermont Episcopal institute, also at Burlington. The number of libraries in the state in 1870 was 1792, containing 727,263 volumes; of which 1056, with 405,536 volumes, were private. The number of newspapers and periodicals published is about 55, of which 7 are dailies, 42 weeklies, and 4 monthlies. The religious organizations in 1870 were divided as follows: Baptist, 131; Christian, 14; Congregational, 183; Protestant Episcopal, 33; Friends, 5; Methodist, 180; Presbyterian, 9; Roman Catholic, 40; Second Advent, 15; Spiritualist, 1; Unitarian, 4; Universalist, 60.

The constitution of the state provides for the meeting once in seven years of a council of censors who propose, if they desire to do so, changes in the constitution, which are acted upon subsequently by a convention called by them. The first of these councils met in 1785, the thirteenth in 1869, and the fourteenth in 1876. The governor, the principal executive officers, and the legislature are chosen by the people biennially. The legislature consists of a senate of 30 members, and a house of representatives of 241 members. The judiciary of the state consists of a supreme court of seven judges, chosen by the legislature; of a chancery court, which the supreme court judges also hold; of a county court in each county; of justices' courts in the several towns; and of probate courts in each probate district. Under the apportionment of 1872 the state is entitled to three representatives in congress, and five electoral votes. The electoral votes have been cast as follows: 1792, Washington and Adams, 3; 1796, Adams and Pinckney, 4; 1800, Adams and Pinckney, 4; 1804, Jefferson and Clinton, 6; 1808, Madison and Langdon, 6; 1812, Madison and Gerry, 8; 1816, Monroe and Tompkins, 8; 1820, Monroe and Tompkins, 8; 1824, John Quincy Adams and Calhoun, 7; 1828, John Quincy Adams and Rush, 7; 1832, Wirt and Ellmaker, 7; 1836, Harrison and Granger, 7; 1840, Harrison and Tyler, 7; 1844, Clay and Frelinghuysen, 6; 1848, Taylor and Fillmore, 6; 1852, Scott and Graham, 5; 1856, Fremont and Dayton, 5; 1860, Lincoln and Hamlin, 5; 1864, Lincoln and Johnson, 5; 1868, Grant and Colfax, 5; 1872, Grant and Wilson, 5; 1876, Hayes and Wheeler, 5; 1880, Garfield and Arthur, 5.

VERMONT UNIVERSITY OF, in Burlington, on lake Champlain; established 1791. In 1865 the legislature gave the institution the avails of the land received from congress under the act of 1862 for the purpose of promoting instruction in agriculture and the mechanic arts, and since that time it has been known as the "university of Vermont and state agricultural college." It is an institution of the state, and under the patronage of no religious denomination. Its original endowment consists mainly of leased lands, given partly by the state and partly by individuals. It has an invested fund (including the agricultural appropriation) of \$160,000, and an annual income of \$20,000. The university is beautifully situated on elevated ground, commanding a magnificent view of lake Champlain and the Adirondacks on the w., and of the Green mountains on the n., e., and south. It has a library of 18,000 vols., a laboratory, and a cabinet of art collections. It embraces departments of arts, science, and medicine. Women are admitted to all the departments except the medical. Professors (1880) in the department of arts, 8; in scientific department, 8; in medical department, 7; in all, 23. Students: art department, 65; scientific department, 17; medical department, 140; in all, 222. M. H. Buckham, D.D., is president.

VERNAL GRASS, SWEET, *Anthoxanthum odoratum*, a grass very common in Britain and throughout Europe and the northern parts of the world generally, growing in meadows, woods, and pastures. It is about a foot high, with spiked oblong panicle, the flowers remarkable as having only two stamens. The spikelets are 1-flowered; the glumes very unequal; the floret accompanied with two rudimentary florets, which botanists have very generally described as two outer paleae. This grass flowers earlier in summer than most of the European grasses. It is relished by cattle, and is sown along with other grasses to form permanent pastures. The pleasant smell of newly mown hay is often chiefly owing to this grass, which is fragrant when drying, and contains coumarin (q.v.). It yields, by distillation, an essential oil of an agreeable odor. The straw of this grass is of use for the finest kinds of straw-plaiting.

VERNATION, in botany, a term employed to designate the manner in which the leaves are arranged in the leaf-bud. It corresponds with aestivation (q.v.) in the flower-bud. There are great differences in the vernalion of plants, and these differences are characteristic not only of species but of genera, and even of natural orders, but the vernalion of the same species is always the same. The vernalion of plants is very interesting: in some the leaves are very simply placed together; in others they are most curiously folded, rolled, or plaited, and interlaced with each other, yet so as to separate most readily when the proper time for their expansion comes.

VERNE, JULES, b. France, 1828; studied law at Paris; brought out a comedy in 1850 called *Les Pailles Rompues*, which was followed by *Onze Jours de Siège*, and several comic operas. He is chiefly known by his "scientific romances," of which the first, *Five Weeks in a Balloon*, appeared in 1863. Among his numerous later works may be mentioned: *A Journey to the Center of the Earth* (1872); *Twenty Thousand Leagues Under the Sea* (1873); *Around the World in Eighty Days* (1874); and *Dick Sands, the Boy Captain* (1878).

VERNET, EMILE-JEAN-HORACE, a celebrated French painter of battle-pieces, in whom may be said to have culminated the talent of a family through several generations distinguished in the sphere of art. His grandfather, CLAUDE JOSEPH, born in 1714, was a native of Avignon. By Antoine Vernet, his father, also a painter, Claude Joseph was early initiated in art, and going at the age of 18 to Italy, he remained there 20 years. Toward the end of that period, much of which had been passed in struggle and privation, his reputation as a landscape and marine painter had become so high that he was invited to Paris by Louis XV., who assigned him apartments in the Louvre. Between this time (1752) and his death in 1789 he painted an immense number of pictures, one of his chief undertakings being a series of large pieces commissioned by government, representing the chief seaports of France. These were 15 in number, and are still to be seen in the Louvre, with many other of his best works. During his life he was held to be, in France, without a rival in his own department; and an honorable rank continues to be assigned him among the painters of his country. He married at Rome an English lady, a Miss Parker, by whom he had a son, ANTOINE-CHARLES VERNET, born at Bordeaux in 1758, and popularly known as Carle Vernet. Carle received his education, in the first instance, from his father, and afterward at the academy of Paris, where, in 1782, he gained the chief prize, which brought with it the privilege, of which he availed himself, of studying for some years in Rome. His subsequent success in Paris was great; he achieved the highest honors of the profession, became chevalier of the order of St. Michel, as also of the legion d'honneur, and died Sept. 27, 1836. He was especially celebrated as a painter of horses; but his chief works were battle-pieces on a large scale, chiefly commemorative of the triumphs of the great emperor, and, as such, amazingly popular with the Parisian public. The principal are: "The Battle of Marengo," "The Morning of Austerlitz," "The Emperor giving orders to his Marshals," "The Bombardment of Madrid," "Battle of Rivoli," "Entrance of Napoleon into Milan," and "Battle of Wagram."

The youth of HORACE VERNET, his son (born in Paris, June 30, 1789), was passed amid the tumults and anarchy of the revolution; and his general education was as irregular and incomplete as in such an element we might suppose it; but he had in his father a capable instructor in art, the hereditary genius for which very early became noted in him. It was the wish of his father that, as he had himself done, his son should go to study at Rome; but he failed in the competition for the traveling-pension for that purpose, given by the *académie des beaux arts*, and the scheme was necessarily abandoned. Undepressed by this disappointment, the young Vernet married and commenced his independent career as a painter, being then (1809) only 20 years of age. The rôle which he chose was that suggested at once by the previous success of his father and the military intoxication of the Parisian public. Young as he still was, he had served for some time as a soldier, not, so far as is known, with any special distinction, yet doubtless with such practical experience of the detail of a soldier's life in the field as would be found exceedingly available in his efforts for distinction of another kind. Whereas the treatment of military subjects by his father and others had been, hitherto, more or less of the conventional and so-called imaginative kind, more properly to be called imaginary, the

new aspirant, with his fuller sympathy and knowledge, sought for his effects in that serious rendering of truth which is the basis of all authentic imagination. In the halt, the bivouac, or the battle, the French soldier should be painted according to the veritable fact of the matter, as Vernet himself had seen, or could rigorously so conceive it. The success which rewarded this attempt at more earnest and truthful conception, was brilliant and instantaneous, his very first pictures of the kind—"The Dog of the Regiment and the Horse of the Trumpet," "Capture of the Redoubt," "Halt of French Soldiers," etc.—being received with an enthusiasm of favor accorded to those of no other artist. In 1812, to confirm this popular approval, the first-class medal was awarded to him; and in 1814 he had the title conferred on him, by the emperor, of chevalier of the legion d'honneur. The unrivaled popularity which he had thus at a bound achieved ever afterward remained with him; and the favor which he enjoyed from the emperor, whose victories he signalized on his canvas, was continued to him by the restored dynasty, whose sympathy with these favorite subjects, which, as occasion served, he continued as before to paint, could only be supposed imperfect. By Charles X. he was, in 1825, made officer of the legion d'honneur; and in the next year he was elected member of the Institute. In 1827 he was appointed director of the French academy at Rome, whither he went to reside. He remained there for several years; and on the withdrawal of the French legation, occasioned by the revolution of 1830, he was appointed to act as representative of his country at the Roman court.

With Louis Philippe, the services of Vernet were in especial request; and one of his most gigantic undertakings, the grand series of paintings in the Constantine gallery at Versailles, commemorative of the triumphs of the French arms in Algeria, was a task prescribed him by that monarch. In pursuance of this object he more than once visited Algeria; as, indeed, throughout his career he frequently became a traveler on similar professional errands. To the last, honors continued to flow upon him. In 1842 he was made commander of the legion d'honneur; and in the universal exposition of 1855 the grand medal of honor was awarded to him. He died Jan. 17, 1863. He left behind him no children; his only daughter, wife of the celebrated Paul Delaroche, having died in 1845.

Though he by no means exclusively confined himself to military subjects, as witness his well-known "School of Raphael," "Judith and Holofernes," and many others, it is on his consummate treatment of these that his fame mainly rests; and in this particular department, though he has many worthy competitors among his countrymen, no one of them can be said to equal him. With the utmost skill in effective composition, he combines in these works a surprising dash, vigor, and truthfulness; the movement and veritable fiery life of conflict is expressed in them with amazing effect. In the London international exhibition of 1862 some good specimens were exhibited.

VERNIER, a scale, by which linear or angular magnitude can be read off with a much greater degree of accuracy than is possible by mere mechanical division and subdivision, derives its name from its inventor, Pierre Vernier, "capitaine et chasteleine pour sa majesté au chateau de Breteuil," who gave a description of it in a tract published at Brussels in 1631. The principle of this invention is essentially as follows: AB (fig. 1)

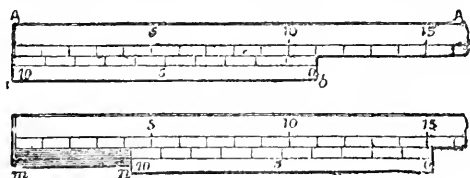


FIG. 1.

the vernier be (fig. 1, A) opposite 11 on AB, the 1 on the vernier is at $9\frac{1}{10}$ ($1\frac{1}{10}$ below 11), 2 on vernier is at $8\frac{2}{10}$ ($2\frac{2}{10}$ below 11), etc. Also, if the vernier be slid along so that 1 on it coincides with a division on the scale, then 0 on the vernier is *one* tenth above the next division on the scale; if 4 on the vernier coincide with a division on the scale, the 0 of the vernier is *four* tenths above a division. The vernier is applied to instruments by being carried at the extremity of the index limb, the zero on the vernier being taken as the index-point; and when the reading off is to be performed, the position of the zero-point, with reference to the divisions of the scale, gives the result as correctly as the mechanical graduation by itself permits, and the number of the division of the vernier which coincides with a division of the scale supplements this result by the addition of a fractional part of the smallest subdivision of the scale. Thus (fig. 1, B), suppose the scale divisions to be degrees, then the reading by the graduation alone gives only a result between 15 and 16; but as the 2d division of the vernier coincides with a graduation on the scale, it follows that the zero-point is $\frac{2}{10}$ of a division above 15, and that, therefore, the correct reading is 15.2° . It will be at once seen that by merely increasing the size of the vernier, as, for example, making 20 divisions of it coincide with 21 on the scale, the latter may be read off to twentieths; and a still greater increase in the size of the vernier would secure further accuracy.

The above is the vernier as proposed by its inventor, and as it was employed for long after his time; but in the more recently constructed astronomical and geodesical instruments a vernier is employed which has one graduation *more* (fig. 2) than the corresponding portion of the scale. A little consideration will show that the only effect of this modification is to enable the vernier to be graduated toward the same direction as the scale, and thus save a little confusion in the reading off. In small instruments, or where the utmost accuracy is required, a small magnifying lens is fixed over the vernier, to enable the observer, in cases where no two graduations coincide (which is generally the case), to estimate the amount of error introduced by assuming that the two graduations which approach nearest to coincidence actually coincide.

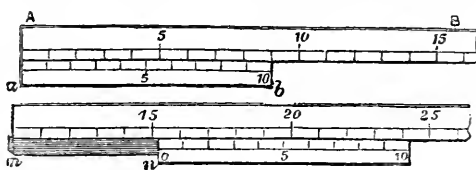


FIG. 2.

Of the various methods for subdivision which were in use before the introduction of the vernier, the most important were the *diagonal scale* (q.v.) and the *nonius*. The latter, so called from its inventor, Petrus Nonius (Pedro Nunez), a Portuguese mathematician, who described it in a treatise *De Crepusculis Olyssipone*, published in 1542, consists of 45 concentric circles described on the limb, and divided into quadrants by two diameters intersecting at right angles. The outermost of these quadrants was divided into 90, the next into 89, the third into 88, etc., and the last into 46 equal parts, giving on the whole a quadrantal division into 2,532 separate and unequal parts (amounting on an average to about 2' intervals). The edge of the bar which carried the sights passed, when produced, through the center, and served, consequently, as an index-limb; and whichever of the 45 circles it crossed at a graduation, on that circle was the angle read off; for instance, if it cut the 7th circle from the outside at its 43d graduation, the angle was read off as $\frac{43}{45}$ of 90°, or 46° 4' 17".

VERNON, a parish in w. Louisiana, having the Sabine river for its w. boundary, separating it from Texas; 1450 sq.m.; pop. '80, 5,160—5,149 of American birth, 377 colored. Co. seat, Leesville.

VERNON, a co. in w. Missouri, having the state line of Kansas for its w. boundary; 800 sq.m.; pop. '80, 19,382—18,912 of American birth, 102 colored. Co. seat, Nevada.

VERNON, a co. in s.w. Wisconsin, having the Mississippi river for its w. boundary; 775 sq.m.; pop. '80, 23,235—17,515 of American birth, 128 colored. Co. seat, Viroqua.

VERNON, a small t. of France, in the dep. of Eure, stands on the left bank of the Seine, 50 m. w.n.w. of Paris by the Havre, Rouen and Paris railway. It contains a handsome Gothic church and numerous picturesque old houses with wooden frameworks, and is the seat of some trade in grain. Pop. '76, 6,384.

VERNON, EDWARD, 1684—1757, b. England; was with Hopson's expedition in 1702, and at the naval battle with the French in 1704. He became rear-admiral in 1708, and was returned to parliament in 1727. Having there declared that Porto Bello could be captured with 6 ships, he was sent out with that number of ships in 1739, and captured it with a loss of only 7 men. He was repulsed from Cartagena in 1741, and lost heavily by sickness. He was several times re-elected to parliament, and commanded on the Kent and Sussex coast in 1745.

VERNON, ROBERT, 1774—1849, b. England. He acquired a fortune in mercantile pursuits, and spent large sums in collecting pictures, mostly by English artists. In 1847 he presented the more valuable part of his extensive collection to the British government. The Vernon collection includes 162 pictures, besides many busts and Gibson's group of Hylas and the nymphs. It is now in the South Kensington museum, and was formerly at Marlborough house.

VERON, LOUIS DESIRÉ, 1798—1867, b. Paris; educated at the imperial lyceum, became a physician, made a fortune by advertising a patent medicine through his connection with papers for which he wrote legitimist and ultramontane articles. In 1829 he founded the *Revue de Paris*. In 1831 he became manager of the grand opera, and brought out *Robert le Diable*; and in 1835 retired, having accumulated a considerable sum. He purchased in 1839 the *Constitutionnel*, and again made a lucky hit by publishing in it Sue's *Wandering Jew*, through which its circulation was enormously increased. He sold his paper after the *coup d'état*, supported the emperor, and became a member of the assembly. He published *Mémoires d'un Bourgeois de Paris, Quatre Ans de Règne*, and *Les Théâtres de Paris* de 1806 à 1860.

VERONA, a province of n. Italy, in the Austrian crown-land of Venice; 1061 sq.m.; pop. '72, 367,437. It is bounded on the n. by the Tyrol; Vicenza and Padua on the e.; Rovigo and Mantua on the s.; Mantua and the lake of Garda on the w., the latter separating it from Brescia. Its surface is mountainous in the direction of the Tyrol, containing Monte Baldo, 6,000 ft. high, and in the s. is the great plain of the Po. It is

intersected by 13 canals, and is drained by the Adige, the Tartaro or Castagnaro river, one of its branches, separating it from Mantua. The valley of the Adige extends from the Tyrol frontier to the delfino of Chiusa, where it flows into the plain of Lombardy near Rivoli, famous for the battle won by Bonaparte and Massena over the Austrians in 1797. In the mountains near Verona is the village of Gargagnago, where Dante wrote part of his *Purgatorio* while a guest of Can della Scala, lord of Verona. Its products are grain, rice, fruit, flax, silk, oil, and wine. Capital, Verona.

VERONA, an ancient and interesting city of northern Italy, in Venetia, stands on a plain at the foot of the hills which lie at the base of the Tyrolean mountains, 72 m. w. of Venice by railway. It stands on the Adige, by which it is divided into two unequal parts, connected by four bridges. The aspect of the town, and of the rich landscape around, is considered remarkably fine. Verona is a fortress of the first rank, a member of the famous quadrilateral (q.v.), and has always been considered a place of strength since it was surrounded with walls by the emperor Gallienus, 265 A.D. Its modern fortifications are among the most extraordinary works of military engineering in Europe. After passing into the hands of the Austrians in 1815, it was greatly strengthened; and after 1849 they made every effort to render it impregnable. Of its many interesting edifices, the chief is the amphitheater, built, it is supposed, between the years 81 and 117 A.D. The building has been wonderfully preserved, the interior being still, to all appearance, complete. The lesser diameter of the building is 404 ft., that of the arena 156 ft.; and the edifice is calculated to have contained 22,000 people. This, as well as many of the other structures of the city, has a handsome appearance, owing to having been built of Verona marble. The *Porta dei Borsari* and the *Arco dei Leoni* are fine Roman gateways, both of the imperial age. The streets of Verona are wide, especially the *Corso*; there are four principal squares, of which the *Piazza dei Signori* contains the palace of the Della Scala and the superb *Palazzo del Consiglio*, the façade of which is adorned with bronze and marble statues of celebrated natives of Verona, including Catullus, Pliny the younger, etc. The picture-gallery contains about 400 specimens, including a *Transfiguration* by Titian, and a full-length portrait and a *Deposition* by Paul Veronese. The cathedral, the date of which is uncertain, but which is attributed to Charlemagne, has a handsome porch, guarded by the celebrated paladins, Roland and Oliver. The more modern parts of the cathedral are exceedingly rich, and among other excellent works of art, it contains a famous *Assumption* by Titian. Altogether, there are in Verona about 40 churches, many of them beautiful specimens of Gothic architecture, and containing valuable paintings and other art treasures. The palaces are also numerous and fine; and there are several theaters, hospitals, etc. Manufactures of woolen goods, hats, cotton, silk, hemp, and hosiery are carried on, and the town trades considerably with Venice in garlic sausages. Excellent cattle are reared on the rich pasturage of the vicinity. Wines and fruit are good and abundant. Pop. of Verona and suburbs, '72, 65,876.

The early history of Verona is involved in obscurity, and there is some difficulty in determining whether it originally belonged to the Euganei or the Cenomani. It afterward fell into the hands of the Romans, and under the empire became one of the most flourishing cities in the n. of Italy. Constantine took it by assault in 312; Stilicho defeated the Goths here in 402. Charlemagne took possession of it, and made it the royal residence of his son, king Pepin. The Montagues, who were Ghibellines, lived here in perpetual and deadly enmity with the Guelf Capulets; and from the contentions that took place between these families, Shakespeare, drawing upon an Italian authority—has derived materials for his tragedy of *Romeo and Juliet*. In 1259 the town received Mastino della Scala as its ruler. In 1405 the city gave itself over to Venice, in order to free itself from its tyrants, who were alternately of the Scala, the Visconti, or the Carrara families. It has since shared the vicissitudes of the rest of Venetia, and in 1866 was ceded to Italy.

VERONESE, PAUL. See CAGLIARI.

VERONICA, the name of a supposed saint of the Roman Catholic church, whose history, and indeed whose historical existence, has been the subject of much controversy. According to the legend, Veronica was one of the women who met our Lord on his way to Calvary; and as he was sinking, overpowered by fatigue, under the weight of the cross, Veronica offered him her veil, to wipe the sweat from his brow, when, wondrous to tell, the divine features were miraculously impressed upon the cloth, and remained as a permanent picture of the face of our Lord. This miraculous picture is reported to have been preserved in Rome at St. Peter's church from about the year 700. Another, of similar appearance, is preserved at Milan; and many Catholic writers, among whom are the learned Mabillon and Papebrock, have supposed that whatever is to be said of the legend of the pious woman at Jerusalem, the name "Veronica" is but founded on an erroneous application of what in reality was meant to designate not the personage, but the picture, which was described as *vera icon* (Gr. *eikon*). "the true image" (i.e., of Christ). Other writers, however, are of opinion that Veronica is a real name, and designates a real personage, although probably erroneously applied in this legend. The picture has been frequently reproduced both in painting and engraving; the most celebrated of the former is one by the great Spanish painter Morales, surnamed "the divine"

from his favorite subject, which was the countenance of our Lord in the "Ecce Homo" and similar subjects.

VERONICA. See SPEEDWELL.

VERPLANCK, GULIAN CROMMELIN, LL.D., 1796-1870; b. New York; graduated, Columbia college, 1801; admitted to the bar; spent several years in Europe; member of the legislature, 1820, and chairman of the committee on education; professor of the evidences of Christianity in the Episcopal theological seminary, New York, 1822; member of congress, 1825-33; state senator for several years; vice-chancellor of state university; president of the New York board of emigration commissioners, 1846-61. He published, among other works, *Evidences of Revealed Religion*; *Essay on the Doctrines of Contracts*; *Addresses and Discourses*; and edited *Shakespeare's Plays with his Life*, 3 vols.

VERRES, a Roman, elected pretor in 74 B.C., and by lot became *prætor urbanus*. At the expiration of his term of office he was appointed governor of Sicily, the richest province of the republic. Here he was guilty of great oppression and extortion, and at the end of his three years' administration was accused by the Sicilians. Cicero managed the prosecution, and Hortensius the defense. Cicero had prepared six orations, but at the close of the first so clear was the guilt of Verres that, without awaiting his sentence, he fled to Masilla, remaining in exile 27 years, and living in affluence on his ill-gotten gains. He perished in the proscription of Antony.

VERSAILLES, a celebrated city of France, and long the residence of the French court, capital of the dep. of Seine-et-Oise, stands on a plain, 11 m. s.w. of Paris by railway. A fine avenue, which forms part of the road from Paris, divides the town into two parts. The town covers a large area in proportion to its population, and is of remarkably regular construction, consisting of long and straight streets, crossing at right angles. Versailles, a city more of pleasure than of industry,—long accustomed to find its sustenance in the expenditure of a luxurious court, and subsequently a place of residence for many foreigners attracted hither by the salubrity of the climate, the fine promenades, and the economy of living, as compared with that in Paris—has few manufactures, and little trade. It is the see of a bishop, and contains a public library of 50,000 vols., many palatial edifices, public fountains, spacious squares, and elm-planted avenues; and when taste in architecture and in landscape-gardening was more formal than at the present time, the town was esteemed the handsomest in Europe. The great attraction of Versailles is its palace, and the history of this structure may be said to be the history of the town. The site occupied by the palace is known to have been that of the ancient priory of St. Julien, the chronicles of which place the date of the building in the early times of the Capetan monarchy. Later, the priory became a feudal stronghold, and its first superior, *Hugo de Versaliis*, lived in the 11th century. In 1570 the manor belonged to Martial de Léoménie, one of the victims of St. Bartholomew. The building was converted by Louis XIII. into a château; and Louis XIV. devoted enormous sums to its embellishment, or rather reconstruction. Louis XV. altered the arrangement of the interior, and meditated alterations that would have changed the whole character of the edifice, but which he was unable to carry out from want of money. Under Louis XVI., Versailles continued to be one of the usual residences of the court down to the period of the revolution, which great event had its beginning here in the meeting of the states-general, in May, 1789. Louis Philippe transformed the palace of Louis XIV. into a museum, to contain trophies of the victories of France. The approach to the palace is by the *Place d'Armes* and the *Cour d'Honneur*, in the latter of which is a large equestrian figure of Louis XIV., and other statues. The entire length of the palace is nearly 1400 feet. The collections embrace pictures of events in French history, portraits of French heroes, etc. The most interesting are the pictures of David which illustrate the career of Napoleon, and those by Horace Vernet. The gardens, with their broad terraces and long alleys, are imposing, but formal; the fountains are on the grandest scale. From the middle of Sept., 1870, till the conclusion of peace in 1871, Versailles was the center of all the operations of the Germans. On Sept. 20, king William and the crown-prince entered the town; and there, on Jan. 18, 1871, the former was proclaimed emperor of Germany. On Jan. 28, the capitulation of Paris was signed in Versailles; after the peace, it became the seat of the national assembly and government of the republic, and was the headquarters of the army under gen. Mac Mahon. Pop. '76, 49,522.

VERSE (Lat. *versus*, from *verto*, to turn, a turning of the plow, a furrow, a row; a line in writing and in poetry), a section or group of meters written in one line. See METER, RHYME. The term verse is often erroneously applied to a group of lines or verses, which is properly a stanza. Verse is often used to signify metrical composition.

VERSECZ, a t. of the Temesvar co., Hungary, stands on the Versecz mountains, 45 m. s. of Temesvar by railway. It is the seat of a Greek non-united bishop. The chief industry is the production of silk, wine, and rice. Pop. 21,095.

VERSICLE (Lat. *versiculus*, a little verse), a short verse in the service, which is spoken or chanted by the priest or minister alternately with a "response" by the people.

VERSIONS. See BIBLE.

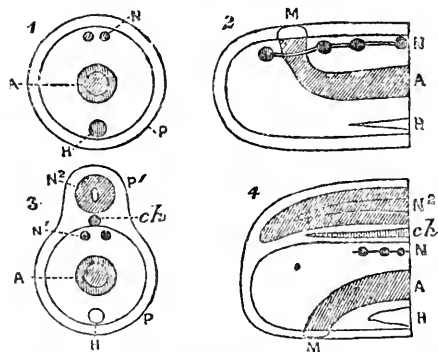
VERST, or **WERST**, in Russian, *wersta*, an itinerary measure, equivalent to 1166½ yards, or about two-thirds of an English mile.

VERT. See **HERALDRY**.

VERTEBRÆ. See **SPINAL COLUMN** and **SKELETON**.

VERTEBRATA, the highest and most important of the animal sub-kingdoms, characterized by the universal presence of a backbone, composed of a varying number of small bones called vertebrae (see **SKELETON** and **SPINAL COLUMN**), which at once serve for the general support of the other parts, and for the protection of the central part of the nervous system (the brain and spinal cord) in a closed cavity in the interior.

We shall notice first the developmental and then the structural peculiarities of the vertebrates. Like the members of the other sub-kingdoms, the vertebrates begin in a semi-fluid nitrogenous substance called plasma, which separates itself (or differentiates, as it is scientifically termed) into albumen, fibrin, primary membrane (the lemma of Owen), nuclei, and cells, in which form, says the above-named physiologist, "the individuality of the new organism first dawns as a nucleated germ-cell, or germinal vesicle." The formation of yolk by the evolution of albuminous granules and oil-particles from the plasma, and the development of an outer layer of membrane, complete the unimpregnated egg. For further development, another principle, the spermatozoon, or product of the sperm-cell, is required. Its reception by the egg is followed by the formation of a germ-mass, which is formed by consecutive divisions, cleavages, or segmentations of the impregnated center, which incorporates more or less of the yolk. Thus far there is no difference between the vertebrate and invertebrate germ. The next step, to use the words of professor Owen, "impresses upon the nascent being its vertebrate type." As has been shown in the article **DEVELOPMENT OF THE EMBRYO**, the parietal portion of the germ becomes raised up on each side into a ridge, so that a long groove or furrow is formed between these parallel ridges (see figs. 6, 7, 8 in **DEVELOPMENT**); and the margins of these subsequently uniting with one another, constitute a tube, in the interior of which the vertebrate cerebro-spinal nervous centers are developed. In the mean time, the margins of the germs extend downward over the yolk till they meet and form the abdominal cavity. Hence in the vertebrates there are developed from the *chorda dorsalis*, or *notochord* (see **DEVELOPMENT**), "a pair of plates 'neurad,'* to inclose the nervous axis, and a pair of plates 'hemad,'† to inclose the vascular axis and organs of vegetative life. Flesh and skin co-extend with the inclosing plates. This formation of two distinct parallel cavities—neurad and hemad—under symmetrical guidance, in the vertical or 'neuro-hemal' direction, with a repetition of parts on the right and left sides, establishing transverse or 'bilateral' symmetry, constitutes the chief developmental characteristics of the vertebrate animal."—Owen's *Anatomy of Vertebrates*, vol. i. p. 2. The accompanying diagrams, which we have borrowed from professor Huxley's *Elements of Comparative Anatomy*, may tend to render this subject more intelligible. In the invertebrates, merely a single saccular or tubular investment is formed, which incloses all the viscera; so that, provided we select one high enough to possess a heart and nervous system—the transverse and longitudinal sections would be represented by 1



Diagrams representing generalized sections of one of the higher invertebrates (1, 2) and of a vertebrate (3, 4).

1, 3, transverse; 2, 4, longitudinal section; A, alimentary canal; H, heart; P, parietes of the body; P', parietes of neural canal; N, nervous centers of invertebrate; N', sympathetic; and N'', cerebro-spinal centers of vertebrate; ch, notochord; M, mouth.

and 2, while P represents the parietes, or wall of the body, A the alimentary canal, M the mouth, H the heart, and N the nervous centers. "It will be observed," says professor Huxley, "that the alimentary canal is in the middle, the principal centers of the nervous system upon one side of it, and the heart upon the other. In none of these animals, again, would you discover in the embryonic state any partition formed by the original external parietes of the body between the nervous centers and the alimentary canal."—*Op. cit.*, p. 59. But the vertebrate, after it has passed through its very earliest stages of development, is, as we have seen, not a single, but a double tube; and the "two tubes are separated by a partition, which was, primitively, a part of the external parietes of the body, but which now lies in a central position between the cerebro-spinal nervous centers and the alimentary canal. Hence a transverse section of any vertebrate animal may be represented diagrammatically by fig. 3, where, for the most part, the letters have but where P' denotes the second or cere-

the same signification as in the foregoing case,

* Backward in man, upward in beasts.

† Forward in man, downward in beasts.

bro-spinal tube. The visceral tube (P) contains, as in the case of the invertebrate animal, the alimentary canal, the heart, and certain nervous centers belonging to the so called sympathetic system. This nervous system and the heart are situated upon opposite sides of the alimentary canal, the sympathetic corresponding in position and in forming a double chain of ganglia with the chief nervous centers of the invertebrata; so that the cerebro-spinal tube appears to be a superaddition—a something not represented in the invertebrate series. In close connection with the profound difference between the chief nerve-centers of the vertebrate and the invertebrate, is another remarkable structural contrast. In all the higher invertebrates, with a well-developed nervous system, the latter is perforated by the gullet, so that the mouth is situated upon the same side of the body as the principal masses of the nervous system; and some of the ganglia of the latter lie in front of, and others behind the esophagus. A longitudinal section of such an animal may therefore be represented by fig. 2. A similar section of a vertebrate animal shows, on the contrary, the chief center of the nervous system not to be perforated by the esophagus, the latter turning away from it, and opening upon the opposite side of the body (fig. 4).—*Op. cit.*, p. 60. No structures having any analogy to the *chorda dorsalis*, or *notochord*, or to the *visceral arches* and *cliffs* (see SKELETON), are to be found in the embryonic condition of any of the invertebrates.

Passing on from the developmental to the structural differences, we universally have the vertebral column and the nervous centers, consisting of brain and spinal cord; and the organs of the five senses are usually present. All possess a distinct vascular system, containing blood, with red and white corpuscles in suspension, and in all (with the solitary known exception of the *amphioxus*, or lancelet), there is a compact muscular heart of two or more cavities, and provided with valves. The breathing organ communicates with the pharynx. The alimentary canal has two apertures, usually at opposite ends of the trunk, the mouth or reception aperture never being formed of modified limbs, or working horizontally, as in the *articulata*, but provided with two bony jaws, placed one above the other, and acting vertically.

All vertebrates possess a hepatic portal system, by which the blood of the alimentary canal is collected into a portal vein which ramifies through the liver. The limbs may be totally absent, or one or two pair, never more. The muscles surround the bony levers on which they act, and thus, under the influence of the will, move the limbs and other parts. The sexes are distinct.

Comparative anatomists differ in their division of the vertebrates into classes, and as to the best basis of classification. Prof. Owen, in his *Anatomy of Vertebrates*, admits of only four classes, viz., fishes, reptiles, birds, and mammals; whereas Milne-Edwards, Huxley, and many of our leading authorities, separate the amphibians from the reptiles, and assign them a class by themselves. Prof. Owen, after describing the modifications of the piscine, reptilian, ovian, and mammalian types, observes that the vertebrates might be binarily divided into oviparous and viviparous; into anallantoic or branchiate, and allantoic or abbranchiate; into *hematothermal* (Gr. *haima*, blood, *thermos*, hot) having four-chambered heart, spongy lungs, hot blood, and *hematorrhal* (Gr. *haima*, blood, *crnos*, cold), having less perfect breathing organs, less complex heart, with cold blood; and adopts the latter. Huxley, on the other hand, after noticing the division of the vertebrates into *branchiate* and *abbranchiate*, and pointing out the non-homogeneous character of the abbranchiates—mammals being so strongly separated from birds and reptiles—suggests the removal of them to an independent position. "Thus," he observes the classes of the *vertebrata* are capable of being grouped into three provinces: (1) The *ICHTHYOIDS* (comprising fishes and *amphibia*), defined by the presence of branchiae at some period of existence, the absence of an amnion, the absence of a rudimentary development of the allantois, nucleated blood corpuscle, and a parasphenoid bone in the skull; (2) the *SATURIANS*, defined by the absence of branchiae at all periods of existence, the presence of a well-developed amnion and allantois, a single occipital condyle, a complex mandibular ramus, articulated to the skull by a quadrate bone, nucleated blood corpuscles, and no parasphenoid, comprising reptiles and birds; and (3) the *MAMMALS*, devoid of branchiae, and with an amnion and an allantois, but with two occipital condyles, and a well-developed basi-occipital, and no parasphenoid, a simple mandibular ramus, articulated with the squamosal, and not with the quadratum, with mammary glands, and with red non-nucleated blood corpuscles."—*Op. cit.* p. 74.—For further details, the reader may consult Stannius's *Comparative Anatomy of the Vertebrata* (in German), Wagner's *Comparative Anatomy of the Vertebrata*, translated from the German by Tulk; the works of Huxley and Owen quoted in this article; and the special departments of Cuvier's *Règne Animal*, and Blanchard's *L'Organisation du Règne Animal*, now in course of publication—a work which, if ever completed, will rival Cuvier's *opus magnum*.

VERTEBRATE ANIMALS (VERTEBRATA, ante). The following is a brief synoptical classification of the principal divisions of the vertebrate branch of the animal kingdom, including, with few exceptions, only classes and orders, and referring to various articles throughout this work, for a description of families, genera, and species. The vertebrate animals include only one subkingdom, *vertebrata*, which may be briefly defined as comprising animals having a body composed of a number of segments placed on a longitudinal axis, and a nervous system chiefly dorsal. A transverse and

vertical section of the body exhibits two cavities completely separated from each other by a partition. The dorsal, or cerebro-spinal nervous system, is contained in the superior or dorsal cavity; the ventral, or inferior cavity, contains the alimentary canal, the heart, and hemal system, and also a nervous system, called the sympathetic, or ganglionic, consisting usually of a double chain of ganglia, connected by nerve fibers, which also contain filaments derived from the cerebro-spinal system. During the embryonic condition of all vertebrates the center of the partition is occupied by an elongated, cellular, cylindroidal mass, called the notochord, or chorda dorsalis, which in some vertebrata continues through life; but it is usually replaced by a partly fibrous and cartilaginous, and partly bony, jointed structure, called the vertebral column. See DEVELOPMENT OF THE EMBRYO, *ante*. Another characteristic of vertebrates is that the alimentary canal never penetrates or passes through any part of the nervous system as it does in invertebrates, the gullet in them passing through an œsophageal nerve collar. In all vertebrates, moreover, that part of the wall of the visceral tube or cavity, which lies at the sides of, and immediately behind, the mouth, has, at a certain stage of development, a series of parallel thickenings, transverse to the axis of the body, which are called the visceral arches, and between these arches there are clefts by which the pharyngeal cavity temporarily communicates with the exterior. Nothing corresponding to these arches and clefts is found in the invertebrata. A vertebrate may have no articulated limbs, and it never has more than two pairs, which always have an internal skeleton to which the muscles are attached. Invertebrates usually have a greater number of limbs, and the muscles are attached to an exo-skeleton. All vertebrates, except the lancelet, have a single valvular heart, and a hepatic portal system, the blood from the alimentary canal being in part returned to the heart by a *portal vein* which ramifies through the liver; and there is also a peculiar system of vessels, called the *lacteal system*, which is an appendage to the venous system of blood-vessels, and consists of a series of vessels which take up the products of digestion, and while they are undergoing partial elaboration, convey them to an entrance into the venous circulation, where they mingle with the venous blood, soon to be sent to the lungs. In regard to the cerebro-spinal and sympathetic nervous systems, the former constitutes by far the greater portion, and in all except the lowest members there is a well-marked separation into spinal cord (*myelon*) and brain (*encephalon*), the proportion of one to the other differing very greatly. The nerves which arise from the cerebro-spinal axis are symmetrically disposed on the two sides of the body, and are chiefly concerned in sensation and motion, and the cerebro-spinal centers also are symmetrically formed, while the sympathetic system is more or less unsymmetrical in form and distribution, and is chiefly concerned in regulating the functions of digestion, circulation of the blood, and lymph, and, to an undetermined extent, respiration.

The cerebro-spinal system is commonly called the system of *animal* life, while the sympathetic system is called that of organic or *vegetative* life, as it has nothing to do, so far as can be ascertained, with voluntary motion. It may be remarked here, however, that the physiology of the nervous system, in some respects, is far from being perfectly understood, although almost innumerable important facts have been ascertained. Although the articulates, such as insects and crustaceans, are particularly associated with the possession of an exo-skeleton exclusive of an endo-skeleton, such as belongs to vertebrates, still many of the latter have an exo-skeleton, formed by a hardening of the outer layer of the integument. The integument is composed of two layers, an outer non-vascular *epidermis*, and a deeper vascular *dermis*, and from these may be developed an epidermal, or a dermal skeleton. The epidermal skeleton is always horny, and is represented under various forms, as in the hairs of animals, the feathers of birds, the scales of serpents and lizards, and the plates of tortoises and turtles. The dermal skeleton may be either horny or bony.

Divisions of the Vertebrata.—This great subkingdom is naturally divided into the five great classes of fishes, amphibians, reptiles, birds, and mammals, or *pisces*, *amphibia*, *reptilia*, *aves*, and *mammalia*. As has been mentioned in the preceding article, however, there are differences of opinion in regard to the relations of members of these classes, so that there is disagreement when it is undertaken to group them into larger sections. The fact that all agree in recognizing the above five divisions, while many high authorities disagree in regard to more general groupings, suggests a question as to the necessity of a more general division.

CLASS I., *Pisces*.—Vertebrate animals which are provided with gills throughout their whole life. The heart, when present, consists, except in *dipnoi*, of a single auricle and a single ventricle, and the blood is cold. The limbs, when present, are in the form of fins, or expansions of the integument, and there is neither an amnion nor an allantois in the embryo, unless the latter is regarded as represented by the urinary bladder. In most fishes there is a peculiar line of scales called the *lateral line*, in which each scale is perforated by a tube leading to a longitudinal canal which runs along the side of the body and is connected with cavities in the head. It has been thought that its chief office was to secrete the mucus which covers the body of the fish, but this idea is now regarded as probably erroneous, and it is generally believed that it has a function connected with the sense of touch. The osseous system in fishes varies widely. In the

lancelet the spinal cord is supported by little more than a gelatinous notochord; in others the skeleton remains cartilaginous, or it is partly cartilaginous and partly osseous, and in others it is entirely converted into bone, although the bone of fishes is unlike the bone of mammals and other vertebrates. The vertebral column of a bony fish has the following characteristics: the vertebrae of which it is composed are hollow at both ends, or *amphicœlous*, and the cup-like margins are united by ligaments, while the cavities between the vertebrae are filled with an elastic gelatinous substance, the remains of the notochord, which acts as a ball and socket joint, well adapted to the great mobility required in these animals. The kidneys are generally greatly developed, forming two elongated organs situated beneath the spinal column and extending along the whole length of the abdominal cavity. The ureters often dilate and form a kind of bladder, the doubtful representative of the allantois above mentioned. The nervous system of fishes is of an inferior type, the brain being very small and principally consisting of ganglia devoted to the special senses. The essential portion of the organ of hearing, the *labyrinth*, is present in most fishes, but there is no compartment external to this having an outer communication, and none is required, as in air-breathing animals.

In regard to the divisions of the class *pisces* they are arranged, according to prof. Huxley, into six orders, the subdivisions of which are according to the classification of prof. Owen:

Order 1, Pharyngobranchii.—This order includes but a single species, the *amphioxus lanceolatus*, or lancelet (q.v.).

Order 2, Marsipobranchii (q.v.).—Body cylindrical, worm-like, and without limbs; skull cartilaginous, and having no lower jaw; notochord persistent; gills sac-like and not furnished with cilia. See LAMPREY and HAG, *ante*.

Order 3, Teleostei.—This order comprises most of those fishes which have a well-ossified endo-skeleton, and nearly corresponds to Cuvier's division of *osseous* fishes. See TELEOSTEI; also ACANTHOPTERYGII, ALEWIFE, ANABASIDÆ, ANAÆLEPS, ARCHER-FISH, BALISTES, BASS (*labrax*), BASSE, BIB, BLUE-FISH, BLACK-FISH, BONITO, BONY-PIKE, BURBOT, BULL-TROUT, CANDLE-FISH, CARR, CLIMBING-PERCH, CLUPEIDÆ, CLUPESCIDÆ, CHARR, COAL-FISH, CHUB, COD, COTTUS, CHÆTODONTIDÆ, CYPRINIDÆ, CYPRINODONTIDÆ, DAB, DACE, DENTEX, DORY, DRUM-FISH, ESOCIDÆ, FIGHTING-FISH, FISTULARIDÆ, FLAT-FISH, FLOUNDER, FLYING-FISH, GADIDÆ, GOLD-FISH, GROUNDLING, GUDGEON, GYMNETRIS, GYMNOTUS, HADDOCK, HALIBUT, HOLOCANTHUS, HERRING, LABRIDÆ, LAMPREIS, LEAPING-FISH, LEUCISCUS, LING, MACKEREL, MALACOPTERYGII, MANGO-FISH, MULLET, OPAH, OSPHIOMENUS, OSTEOGLOSSIDÆ, OSTRACION, PARALEPIDIDÆ, PERCH, PERCOPSIDÆ, PHARYNGOGNATHI, PIKE, PIKE-PERCH, PILCHARD, PILOT-FISH, PIPE-FISH, PLAICE, PLEURONECTIDÆ, POGONIAS, POLLACK, POLYPTERUS, REMORA, ROACH, ROCKLING, ROUND-FISH, SALMON, SALMONIDÆ, SAURY-PIKE, SCABARD-FISH, SCAD, SCOMBERESOCIDÆ, SCOMBERIDÆ, SEA-PIKE, SHAD, SHEEPSHEAD, SILURIDÆ, SMELT, SOLE, SPARIDÆ, SPHYRÆMIDÆ, SPRAT, SWORD-FISH, STAR-GAZER, TAUTOG, THERAPONIDÆ, TOAD-FISH, TOMCOD, TROUT, TRUNK-FISH, TUNNY, TURBOT, WHITE-BAIT, WHITE-FISH, WHITING, WOLF-FISH, WRASSE.

Order 4, Ganoidei.—This is an important order, but is represented more by extinct than by living forms, reaching far back in geological time, and furnishing many of the most interesting studies in paleontology. At the present epoch the order consists of only seven genera, viz.: 1, *lepidosteus*; 2, *polypterus*; 3, *calamioichthys*; 4, *ania*; 5, *acipenser*; 6, *scaphirhynchus*; 7, *spatularia*; all confined to the northern hemisphere, and principally to fresh water. They have the following characteristics: The endo-skeleton is only partially ossified, most of the vertebral column remaining cartilaginous during life, especially in the palæozoic forms, in which the notochord is often permanent. The skull has distinct cranial bones, and there is a lower jaw-bone. The exo-skeleton is in the form of ganoid scales (see GANOID FISHES, *ante*) or spines. There are usually two pairs of lateral fins, supported by fin rays, the first rays being generally in the form of strong spines. The pectoral arch is furnished with a clavicle, and the ventral fins are close to the anus. The caudal fin is generally unsymmetrical (heterocercal). There is always an air-bladder, which is provided with an air-duct, and is often cellular. The intestine is furnished with a spiral valve. The gills and opercular apparatus resemble those of the teleostei. The heart has one auricle and one ventricle, and the base of the branchial artery is dilated into a *bulbus arteriosus*, which is rhythmically contractile, and has a coat of striated muscular fibers and several transverse rows of valves. The most important of these characteristics are, the partially ossified condition of the endo-skeleton, but which varies as to extent of ossification. In most of the older forms the notochord remains, no vertebral centra are developed, and the skull is cartilaginous and protected by ganoid plates; but even in these the outer parts of the vertebrae are often ossified. In others the vertebrae are biconcave or amphicœlous, as in teleostei. In one ganoid, however, the bony pike or *lepidosteus*, the vertebrae are opisthocœlous, or concave behind and convex in front. This is regarded as the highest point of development in the vertebral column of any fish, and as being more reptilian than piscine. The ganoid scales are composed of two layers, an inferior one of bone, and an outer one of enamel, similar to that of teeth, and called *ganoinæ*. The most typical form of these plates is rhomboidal, and placed edge to edge without overlapping, articulated by means of distinct processes, and forming oblique rows. Sometimes, however, the plates or scales

are circular, and overlap each other as in ordinary fishes. In the sturgeon there are detached dermal plates of true bone. Both pectoral and ventral fins are usually present, the ventrals being placed far back. In some forms the paired fins are arranged so as to form a fringe around a central lobe, and for this reason prof. Huxley has arranged them in a distinct section called *crossopterygidae* (fringe-finned). The same form is found in the sixth order, *dipnoi*. The caudal fin varies in form, being sometimes homocercal, and sometimes heterocercal, and therefore, in this respect, the ganoids are midway between the bony fishes (teleostei) and the sharks and rays. Like the bony fishes, the ganoids have free, pectinated gills attached to branchial arches and inclosed in a branchial chamber protected by a gill-cover, and closed by a branchiostegal membrane, usually supported by branchiostegal rays. The sturgeon (*acipenser*) and *polypterus* are furnished with spiracles on the top of the head, communicating with the mouth. The order *ganoidi* may be divided into two sections, *lepidoganoidi*, in which the body is furnished with scales of moderate size, and the endo-skeleton is more or less perfectly ossified; and *placoganoidi*, in which the skeleton is imperfectly ossified, and the head and more or less of the body are protected by large ganoid plates, often united by sutures. See BOXYPIKE, CEPHALASPIS, POLYPTERUS, PTERICHTHYS, and STURGEONS, *ante*.

Order 5, Elasmobranchii.—This order is equivalent to the *selachia* of Müller, the *placoids* of Agassiz, and the *holocephali* and *plagiostomi* of Owen, and to the most typical portion of the cartilaginous fishes of Cuvier. It may be briefly defined by the following characters: The skull and lower jaw are well developed, but there are no distinct cranial bones, the skull consisting of a single cartilaginous box, without sutures; vertebral column sometimes composed of distinct vertebrae, sometimes cartilaginous. The exo-skeleton is composed of placoid granules, tubercles, or spines; two pairs of lateral fins, supported by cartilaginous fin rays, the ventral fins far back; pectoral arch has no clavicle; heart consists of one auricle and one ventricle, and a *bulbus arteriosus* rhythmically contractile and having a coat of striated muscular fibers, and several transverse rows of valves. The gills are pouch-like, differing materially from those in teleostei and ganoidi. In the sharks and rays the branchial arches are fixed, and the branchial chamber is divided into a number of distinct pouches, and each partition supports a series of branchial laminae attached to each side like the leaves of a book. The separate pouches open into the pharynx by a separate slit, and communicate externally with the water by a separate aperture placed on each side of the neck. There is, therefore, no gill-cover and no branchiostegal membrane or rays. The elasmobranchii are divided into two sub-orders: *holocephali*, in which the mouth is terminal, and there is only a single gill-slit, and the *plagiostomi*, in which the mouth is transverse and placed on the under surface of the head, and there are several gill-slits on each side of the neck. The suborder *holocephali* includes several curious fishes, of which the only living forms are the chimeridae. See CHIMERA, *ante*. There are several fossil representatives in the secondary and tertiary formations constituting the genera *elaphodus*, *elasmodus*, and *ischiodus*. The suborder *plagiostomi* includes the sharks (q.v.) and the rays (q.v.).

Order 6, Dipnoi.—This order includes only certain kinds of mud-fishes, *lepidosiren* and *ceratodus*, and is considered by some to be a connecting link between the fishes and the amphibia. See LEPIDOSIREN, *ante*. The *lepidosiren* formerly constituted the lowest order of amphibia, but most authorities now place it as the highest order among the fishes. The body is fishlike in form, the skull has distinct cranial bones and a lower jaw, and the notochord is persistent; there are no vertebral centra nor an occipital condyle. The exo-skeleton in living types is composed of overlapping cycloid scales, but the fossil forms have ganoid scales. The dipnoi resemble the amphibians in having a heart with three cavities—two auricles and one ventricle—and in having true lungs and a trachea and glottis, the blood returning to the heart by a distinct pulmonary vein.

Distribution of Fishes in Time.—The oldest representatives of fishes are ganoids, and four genera are found in the upper silurian rocks. Their maximum development was in the Devonian red sandstone. The stureonidae commenced their existence in the mesozoic formations (lias) and a true sturgeon, *acipenser tolupicus*, in the eocene. The elasmobranchii (sharks and rays) commenced at the close of the upper silurian in the upper Ludlow rocks. Their remains consist of spines and fin rays, from which the genus *onchus* has been established. Portions of *shagreen* have been referred to the genus *sphagnotus*. The true sharks are represented in the later mesozoic deposits, but they are mostly found in the tertiary formation, several genera in the eocene. The true rays, however, are older than the true sharks, probably beginning in the carboniferous rocks. Until recently the dipnoi were not known to be represented in past time, but the triassic and Jurassic teeth upon which Agassiz founded his genus *ceratodus* are now regarded as belonging to this order. The teleost fishes first made their appearance in the cretaceous formation, toward the end of the mesozoic epoch, but after this they are the chief representatives of the whole class of fishes, and they now seem to have reached their greatest development.

CLASS II., AMPHIBIA.—This class comprises the frogs and toads, the salamandroids, the cecilia, and the extinct labyrinthodonts. See AMPHIBIA and BATRACHIA, *ante*.

CLASS III., REPTILIA.—The reptiles are divided into ten orders, four of which are represented by living forms, and six of which are extinct. The living orders are, 1, *chelonia*, the tortoises and turtles; 2, *ophidia*, the serpents; 3, *lacertilia*, the lizards; 4,

crocodilia, the crocodiles and alligators. The extinct orders are 5, *ichthyopterygia*; 6, *sauropterygia*; 7, *anomodontia*; 8, *pterosauria*; 9, *dinosauria*; 10, *theriodontia*.

Order 1, *Chelonia* (q.v.).—See also TORTOISE, TURTLE, and SNAPPING-TURTLE, *ante*.

Order 2, *Ophidia*—comprising the snakes and serpents. See SERPENTS, BOA, COBRADI-CAPELLO, COLUMBER, ELAPS, LACHESIS, PUFF-ADDER, PYTHON, RATTLESNAKE, TOXODON, TRIGONOCEPHALUS, and VIPERIDÆ.

Order 3, *Lacertilia*—comprising those animals commonly known as lizards and some serpent-like forms, and having the following general characters: Two pairs of well-developed limbs as a rule, but there may be but one pair, and sometimes there are no limbs; but a scapular arch is always present. There is generally an exo-skeleton in the form of horny scales, like those of snakes. The vertebrae of the dorsal region are concave in front, but rarely concave at both ends. There is a single transverse process at each side of a vertebra, and the heads of the ribs are simple and undivided. There is either no sacrum, or the sacral vertebrae rarely number more than two. The teeth are not set in distinct sockets, except in some extinct forms, and the eyes are usually furnished with movable eyelids. The heart contains two auricles and a ventricle, the latter being partially divided by an incomplete partition. The order *lacertilia* are often grouped with the *crocodilia*, under the name *sauria*, and this is a convenient term to designate all reptiles which resemble the typical lizards. All the *lacertilians* have teeth, which are always simple; sometimes sharp and conical, as in *monitor*; sometimes blade-like, with serrated edges, as in *iguana*; and sometimes with rounded, crushing crowns. The order is sometimes divided into three sections, according to the structure of the tongue. In the first section the tongue is long and can be protruded, as in serpents; in the second section, including the geckos, the tongue is thick and fleshy, and not protrusible; in the third section, which contains the chameleons, the tongue is long, protrusible, and worm-like, with a clubbed extremity. See CHAMELEON, LIZARD, GECKO, IGUANA, and MOSOSAURUS, *ante*.

Order 4, *Crocodilia*.—This is the highest order of living reptiles, and includes the crocodiles (q.v.), alligators (q.v.), and gavials (q.v.). See also JACARE and CAYMAN.

Extinct Orders of Reptiles.—Order 5, *Ichthyopterygia*, Owen (*Ichthyosauria*, Huxley). See *ICHTHYOSAURUS*, *ante*.

Order 6, *Sauropterygia*, Owen (*Plesiosauria*, Huxley). See *PLESIOSAURUS*, *ante*.

Order 7, *Anomodontia*, Owen (*Dicynodontia*, Huxley). The prominent characters of this order are in the jaws, which are regarded as having been encased in horn, forming a kind of beak like that of chelonians. In the genus *oudenodon* both jaws were probably without teeth, but in the other genus, *dicynodon*, the upper jaw was furnished with two long tusks. The pectoral and pelvic arches were very strong, and the limbs well developed and adapted to walking and not swimming. These forms are found in the triassic strata of s. Africa and India.

Order 8, *Pterosauria*.—This order includes the extraordinary group of flying reptiles belonging to the mesozoic epoch. See *PTERODACTYL*, *ante*.

Order 9, *Dinosauria*.—Most of these animals were gigantic, and supposed by some to have had affinities with the pachydermatous mammals. The skin was sometimes naked, sometimes having an exo-skeleton of bony shields like those of crocodiles; anterior trunk-ribs double-headed; teeth set in distinct sockets. There were always two pairs of limbs, very strong, and furnished with claws. In some the fore limbs were small compared to the hind limbs. See *DIXOSAURIA*, *ante*, *HADROSAURUS*, *HYLEOSAURUS*, *IGUANODON*, *MEGALOSAURUS*, and *TITANOSAURUS*.

Order 10, *Theriodontia*.—This order was established by prof. Owen for the reception of a number of carnivorous reptiles of the triassic period. The dentition is of the carnivorous type, there being three distinct sets of teeth, incisors, canines, and molars. The canines were long and pointed. In *cyonodracon*, which is regarded as the typical genus, the canines are not only immense, but are compressed, and have the hinder trenchant border minutely serrated, as in the canines of the saber-toothed tiger or *machærodus* (q.v.). The humerus also resembles in some respects that of the cat family, and other carnivorous mammals, in having a supra-condyloid foramen for the protection of the median nerve and brachial artery.

CLASS IV., AVES.—See *BIRDS*, *ante*. The members of this class may be defined as *oviparous vertebrates* with warm blood, a double circulation, and a covering of feathers (Owen). The embryo has an amnion and allantois, and branchiæ are never developed at any period of existence upon the visceral arches. The skull articulates with the vertebral column by a single occipital condyle. The form of the vertebral centra varies, but it is never amphicœlous or cup-shaped at both ends, except in the remarkable *ichthyornis dispar*, found by prof. Marsh in the cretaceous rocks of North America. Each half of the ramus of the lower jaw consists of a number of pieces which are separate in the embryo, and the jaw articulates with the skull, not directly, but by the intervention of a *quadrate bone*, as in reptiles. This peculiarity, together with that of the possession of nucleated red blood globules, has led prof. Huxley, notwithstanding vast differences in other respects, to place birds and reptiles in one division, to which he has given the name of *sauropsida* (q.v.). The heart, in birds, contains four chambers, two auricles and two ventricles, as in mammalia, and there is no communication between the pulmonary and systemic circulation, as in reptiles. The blood is warm

(103° to 104° Fahr.). The respiratory organs are in the form of spongy, cellular lungs, which are not freely suspended in pleural sacs, and the bronchi open into a number of air-sacs in different parts of the body. The respiration in birds is more complete and active than in any other class of vertebrates, which accounts for their higher temperature, and is naturally associated with their great activity and high order of *physique*. The following arrangement, somewhat altered from Cuvier's classification, is the one probably most generally followed. It includes seven orders: 1. *Natatores*, or swimmers; 2. *Grallatores*, or waders; 3. *Cursores*, or runners; 4. *Rasores*, or gallinaceous birds; 5. *Scansores*, or climbers; 6. *Insessores*, or perchers; 7. *Raptores*, or birds of prey. To these may be added two subclasses, *saurornithes*, containing the order *saururæ*; and *odontornithes*, containing two orders, *odontolæ*, and *odontornæ*.

Order 1, Natatores, divided into four families, viz., 1. *Brevipennate*, including the penguins (q.v.), auks (q.v.), guillemots (q.v.), divers (q.v.), and grebes (q.v.); 2. *Longipennate*, comprising laridæ (q.v.) and procellariidæ (petrels); 3. *Totipalmate*, including the pelicans (q.v.), cormorants (q.v.), gannets (q.v.), frigate bird (q.v.), darter (q.v.), and others; 4. *Lamellirostres* (q.v.), including the ducks (anatidæ), geese (anserinæ), swans (cygnidæ), and others. See ALBATROSS, ANAS, BRENT-GOOSE, BLACK-DUCK, BLUE-WING, CANVASBACK, CEREOPSIS, GARROT, GOOSE, HARELD, KITTIWAKE, HARLEQUIN-DUCK, MUSK-DUCK, PALAMIDIDÆ, SCAUP-DUCK, SHELL-DRAKE, SHOVELER, SUMMER-DUCK or WOOD-DUCK, SWAN, SPHENISCIDÆ, TEAL, TROPIC BIRD.

Order 2, Grallatores.—See GRALLE, *ante*, including the families *otidæ* or bustards (q.v.), *charadriidæ* (q.v.), or plovers (q.v.). See also KILDEER and LAPWING. *Gruidæ* or cranes (q.v.). See also DEMOISELLE and TRUMPETER. *Ardeidæ*. See HERON, ADJUTANT, IBIS, MARABOU, NIGHT-HERON, OPEN-BILL, SAND-HILL CRANE, SPOONBILL, STORK, TANTALUS. *Scopaciidæ* (q.v.). See AVOCET, CURLEW, GODWIT, GREENSHANK, RUFF, SNIFE, WOODCOCK, YELLOW-LEGS. *Rallidæ* (q.v.) or rail (q.v.). See also GALLINULE, GANGA or SAND-GROUSE, and NOTORNIS.

Order 3, Cursores, divided into two families, *struthionidæ* and *apterygidæ*. See CASOWARY, EMEU, DINORNIS, DODO, OSTRICH, RHEA, and APTERYX.

Order 4, Rasores, or gallinaceous birds (q.v.), including the following families: *Columbidæ* (q.v.). See also BRONZE-PIGEON, CARRIER-PIGEON, DOVE, FRUIT-PIGEON, GROUND-DOVE and GROUND-PIGEON, PARTRIDGE-PIGEON, PIGEON, and TURTLE-DOVE. *Cuculidæ*. See CURASSOW and GUAN. *Phasianidæ* (q.v.). See also ARGUS, FOWL, GUINEA-FOWL, LYRE-BIRD, PHEASANT, MACARTNEY-COCK, TRAPOGAN, TURKEY. *Tetraonidæ*, or grouse family. See BLACK COCK, BONASIA, CAPERCAILLIE, FRANCOLIN, GROUSE, PARTRIDGE, PTARMIGAN, QUAIL, VIRGINIAN QUAIL. *Chironidæ*. See SHEATH-BILL. *Tinamidæ*. See TINAMON.

Order 5, Scansores or climbers (q.v.), containing the following families: *Psittacidæ* or parrots (q.v.). See also COCKATOO, LORIKEET, MACAW, PAROQUET, and OWL-PARROT. *Ramphastidæ*. See ORTYPHAGA and TOUCAN. *Picidæ*, or woodpeckers (q.v.). See also BARBET and WRYNECK. *Cuculidæ*. See CUCKOO and HONEY-GUIDE.

Order 6, Insessores (q.v.), divided into four sections or tribes, according to the form of the beak, viz., *cinirostres*, *dentirostres*, *tenuirostres*, and *fissirostres*.

The *cinirostres* contain the following families: *Fringillidæ* (q.v.) or finches (q.v.). See BEEF-EATER, BULLFINCH, BOB-O-LINK, CROSSBILL, GOLDFINCH, GREENFINCH, HAWFINCH, LINNET, ORTOLAN, PINE-FINCH, SNOW-BIRD, SNOW-BUNTING, WEAVER-BIRD, and YELLOW-BIRD. *Corvidæ*, or crows. See CORVIDÆ, CROW, MAGPIE, ROOK, UMBRELLA-BIRD. *Sturnidæ*, or starlings (q.v.). See also BOWER-BIRD, GRAKLE, and TROOPAL. *Paradisaidæ* (q.v.) or birds of paradise (q.v.). See also PLUME-BIRD. *Buceridæ*. See Hornbill (sometimes placed with corvidæ). The *dentirostres* contain the following families: *Sylviidæ* (q.v.), or warblers (q.v.). See also BECCAFCO, BECCAMOSCHINO, BLACK-CAP, GOLDEN-CRESTED WREN, HEDGE-SPARROW, NIGHTINGALE, TITMOUSE, TAILOR-BIRD, WHITE-THROAT. *Muscicapidæ* (*coloptridæ*) or fly-catcher family. See KING-BIRD, FLY-CATCHER, and INSECTIVOROUS BIRDS. *Lanidæ*, or shrikes (q.v.). See also BARITAN. BUTCHER-BIRD, VIREO or GREENLET, and WOODCHAT. *Turdidæ* or *Meralidæ* (q.v.), or thrushes (q.v.). See also ANT-CATCHER, BANANA-BIRD, BLACKBIRD, BLUEBIRD, BLUE-THROAT, DIPPER, REDBREAST, RED-WING, RING OZEL, ROBIN, and THRASHER. The *tenuirostres* contain the families: *Ampeidæ* or chattering (q.v.). See BELL-BIRD, COTINGA, and WOOD-SWALLOW. *Upupidæ*. See HOOPOE and RIFLE BIRD. *Trochilidæ*. See HUMMING-BIRD. The *fissirostres* contain several families whose classification is not well settled. See BEE-EATER, GOAT-SUCKER, NIGHT-HAWK, WHIP-HOR-WILL, SWALLOW, SWIFT, PEWEE.

Order 7, Raptores.—The members of this order are distinguished by their strong, curved, sharp-edged, and sharp-pointed bills, the upper mandible being the longest, and hooked at the tip. The order is divided into two great sections: *nocturnal raptores* and *diurnal raptores*, the first comprising the single family *strigidæ* (q.v.) or owls (q.v.); the second, or diurnals, including two subsections or groups, *accipitrinæ*, comprising the falcons, hawks, and eagles, and the *vulturidæ*, or vultures. The raptores always live in pairs, and the males and females are said to live together during life, instead of mating every season, like other birds. The female is generally larger than the male, but has less brilliant plumage. See CONDOR, EAGLE, EAGLE-HAWK, EAGLE-OWL, ERNE, ELANET, EGYPTIAN VULTURE, GOSHAWK, FALCON, HARRIER, HAWK, HONEY-BUZZARD, LAM-

MERGEIER, OSTRICH, OWL, PIGEON-HAWK, PEREGRINE FALCON, SPARROW-HAWK, and VULTURE. The subclass saurornithes contains the order *saurura*, which includes only the extinct bird *archaeopteria macrura*, a single specimen of which has been discovered in the lithographic slates of Solenhofen, in the upper oolite. It was about the size of a rook, and had the remarkable peculiarities of two free claws on each wing, and a lizard-like tail, longer than the body, composed of separate vertebrae. The tail was destitute of a plowshare bone, and each vertebra supported a single pair of quills. The metacarpal bones were also not anchylosed together as in all other birds. The subclass odontornithes contains two orders, *odontoeae* and *odontornae*. See ODONTORNITHES.

CLASS V. MAMMALIA (q.v.).—This class comprises fourteen well-recognized orders, as follows:

- 1, *Monotremata* (q.v.).—See DUCK-BILL and ECHIDNA.
- 2, *Marsupialia* (q.v.).—See BANDICOOT, FLYING PHALANGER, KAALA, KANGAROO, OPOSSUM, PHALANGER, PHASCOGALE, and YAPOCK.
- 3, *Edentata* (q.v.).—See AARD-VARK, ANT-EATER, ARMADILLO, CLAMYPHORUS, GLYPTODON, MEGATHERIUM, MYLODON, SLOTH, WART-HOG.
- 4, *Sirenia* (q.v.).
- 5, *Cetacea* (q.v.).—See BELUGA, CADING WHALE, DELPHINAPTERA, DELPHINO-RHYNCHUS, DOLPHIN, BLACK DOLPHIN, GRAMPUS, KILLER, WHALE.
- 6, *Ungulata* (q.v.).—See ALPACA, AXIS, CAMEL, CAPRIDÆ, CASIMERE GOAT, BABYROUSSA, BOAR, BUSH ANTELOPE, BOUGNETIN, DZIGGEHAL, EQUIDÆ, HORSE, BARB, PONY, RACE-HORSE, QUAGGA, ASS, ZEBRA, BOVIDÆ, BUFFALO, GNU, ZEBU, MUSK-OX, OX, NIARE, MUFFLON, SHEEP, GOAT, CARIACOU, DEER, ANTELOPE, ELAND, ELK, GAZELLE, HART, ROE, MUSK-DEER, REINDEER, MEGACEROS HIBERNICUS, KAAMA, IBEX, NYLGHAU, OREODONTIDÆ, PACHYDERMATA, STAG, TITANOTHERIUM, PALÆOTHERIDÆ, TOXODON, GAUR, HIPPOPOTAMUS, LOPHIODON, TAPIR, ZAMOUSE.
- 7, *Hydracoides*.—See DAMAN.
- 8, *Proboscidea*.—See ELEPHANT, LOXODON, MASTODON, and DINOTHERIUM.
- 9, *Carnivora*.—Distinguished by always having two sets of teeth, which are simply covered with enamel, and are always of three kinds: incisors, canines, and molars. The clavicles are either altogether wanting, or are rudimentary. The order is divided into three sections: pinnigrada, plantigrada, and digitigrada. *Sec. 1. Pinnigrada*, comprises the amphibious seals and walruses. See PINNIGRADES, MORSE, OTARY, SEAL, and WALRUS. *Sec. 2. Plantigrada* (q.v.). See BADGER, BEAR, BINTURONG, COATI, GLUTTON, and RACCOON. *Sec. 3. Digitigrada*, in which the heel is raised above the ground, so that the animals walk more or less upon the tips of the toes, but this characteristic varies. We will divide this section into five families: *Fam. 1. Mustelidæ* (q.v.). See ERMINE, FERRET, MARTEN, MINK, OTTER, POLE-CAT, and SKUNK. *Fam. 2. Viverridæ* (q.v.). See also ICHNEUMON, SURICATE, CIVET, and GENET. *Fam. 3. Hyenidæ*. See HYENA and AARD WOLF. *Fam. 4. Canidæ*, comprising the dogs, wolves, foxes, and jackals. See BEAGLE, BEDLINGTON TERRIER, BULLDOG, BLOODHOUND, COACH-DOG, COCKER, CERDOCYON, CORSAK, DHOLE, DOG, DOG-FOX, DUSICYN, FENNEC or ZERDA, FOX, FOXHOUND, GREYHOUND, HARRIER, HOUND, JACKAL, LAP-DOG, LURCHER, MALTESE DOG, MASTIFF, NEWFOUNDLAND DOG, NOOTKA DOG, POODLE, PUG, POINTER, SETTER, SHEPHERD'S DOG, WOLF, WOLF-DOG. *Fam. 5. Felidæ* (q.v.). See CAT, JAGUAR, TIGER, TIGER-CAT, OCELOT, PUMA, MACHLEROBUS.
- 10, *Rodentia* (q.v.).—In family *leporidæ* see HARE and RABBIT; in family *hystricidæ* see PORCUPINE; *spallucidæ*, see MOLE RAT; *muridæ* (q.v.), see LEMMING, MOUSE, MEADOW-MOUSE, MUSQUASH, and RAT; *dipodidæ*, see JERBOA; *chinchillidæ*, see CHINCHILLA; *castoridæ*, see BEAVER, COYPU; *sacromyidæ* (q.v.), see POUCHED RAT; *sciuridæ*, see DORMOUSE, FLYING SQUIRREL, GROUND SQUIRREL, MARMOT, PRAIRIE-DOG, SQUIRREL, WOODCHUCK.
- 11, *Cheiroptera*.—See BAT, NOCTILIONIDÆ, PTEROPIDÆ, VESPERTILIONIDÆ, PHYLLOSTOMIDÆ.
- 12, *Insectivora* (q.v.) *Talpide*.—See SHREW-MOLE, STAR-NOSE. *Soricidæ* (q.v.). See MUSK-RAT, SHREW, *Erinaceidæ*. See HEDGE-HOG. *Tupaidæ*. See BANXING. *Galeopithecidæ*. See FLYING LEMUR.
- 13, *Quadrumania* (q.v.).—See AYE-AYE, BABOON, BARBARY APE, CAPUCHIN MONKEY, CHIMPANZEE, CIRCOCBUS, CROPHITHECUS, DOUROUCOULI, ENTELLIS MONKEY, GALAGO, GORILLA, HYLOBATES, MARMOSET, MIDAS, MONKEY, NASALIS, NYCTICEBINÆ, ORANG, PONGA, SEMNOPITHECUS, SPIDER MONKEY, WANDEROO.
- 14, *Bimana* (q.v.).—See MAN, HOMINIDÆ, ETHNOLOGY, MALAYS, MONGOLS, NEGROES.

VERTIGO, in medicine, designates a sensation which the patient describes as one of going to fall, or of turning round, or of everything turning round him. It comes on without premonitory symptoms, excepting a sense of disturbed balance, which may either precede, accompany, or follow it. Associated with it are frequently some of the following symptoms: flashes of light before the eyes, buzzing in the ears, painful sensations in the head, nausea, vomiting, trembling with cold perspirations, muscular tremors, a full, slow, or small and frequent pulse, flushing or pallor of the face, and cold feet.

Giddiness and *dizziness* are only other names for vertigo, although giddiness is com-

monly applied to its milder forms. Attacks of it come on in paroxysms, usually repeated several times a day, and lasting from a few minutes to a quarter of an hour. This disease is frequently chronic, the chief predisposition to it being in middle and advanced age. Childhood is nearly exempt from it, an observation in accordance with the well-known fact, that children can bear rapid rotatory movements without the induction of giddiness better than adults. A plethoric constitution, especially if associated with a sedentary mode of life, the so-called change of life in women, the debility brought on by exhausting discharges, and the abuse of spirituous liquors, may be regarded as predisposing causes to this affection. The direct cause of vertigo is doubtless an irregularity of the supply of blood to the brain. Hence any condition that occasions either an increase or diminution in the supply of blood, is followed by vertigo. For example, it commonly accompanies disease of the heart, and especially hypertrophy of the left ventricle; it is also induced by suppressed hemorrhoids, or other constant form of discharge or loss of blood. Injuries and diseases of the brain, and especially of the cerebellum, are often accompanied by this symptom, and so also are diseases of the spleen. Among the most common exciting causes are intoxication, not only from alcoholic drinks, but from narcotics, such as smoking tobacco, inhaling carbonic acid gas, or semi-poisoning by belladonna, digitalis, hyoscyamus, etc., gorging the stomach with indigestible food (especially if highly carbonated drinks are at the same time taken); unusual movements or positions of the body, and especially of the head, as in sea-voyages, continued stooping, etc.

There is a peculiar kind of vertigo which occurs in dreams. The direction of the apparent movement is generally from above downward; dreams of tumbling down stairs being, according to Romberg, the most common; people also dream of sinking into the earth, of chasms opening before them, etc.

According to Boerhaave, "vertigo is the most easily cured of all the diseases of the head." This statement is too positive; the vertigo that is caused by profuse discharges and exhaustion is curable, while it is beyond the aid of treatment when it accompanies cerebral disorganization. The treatment of course depends upon the cause; while in some cases tonics (the mineral acids, small doses of nux vomica, quassia, etc.) are required; in others, the local abstraction of blood from the nape of the neck, cold effusion, etc., are required. The following rules are, however, generally applicable for the treatment of patients subject to giddiness. They should avoid violent, continuous, or rotatory exercise, abstain from highly nutritious or heating articles of diet, and from suppers; they should not indulge in much sleep, or the use of feather-beds or of warm baths. Counter-irritation to the skin by sinapisms, foot-baths with mustard, the use of the flesh-brush, with cold washing of the body, and the administration of cooling laxatives are to be recommended. (A good laxative of this kind is obtained by mixing six drams of sulphate of magnesia [Epsom salts] with two drams of carbonate of magnesia, and taking a teaspoonful three times a day.) When the patient feels the attack coming on, Romberg directs that he should "direct his full attention to movement. The patients do this, in a measure, of their own accord, by supporting themselves firmly with their hands and feet, in order to resist the illusory movement. The sense of vision may be employed for the same purpose; thus, the vertigo produced by rotatory movement of the body may be suppressed by looking steadily at the finger held up to the eye, or by turning round in a direction opposite to the previous movement."—*On Diseases of the Nervous System*, Syd. Soc. Ed. vol. i., p. 102.

Few of our readers are probably aware of the remarkable vertiginous conditions which they can artificially induce in their own persons. Purkinje, the well-known anatomist and physiologist, was the first who brought these remarkable facts within the range of experimental science in two memoirs published in 1820 and 1827. Vertical vertigo is thus produced. The experimenter—who must be standing—has a somewhat heavy weight attached to each hand, and as he carefully watches the sensation produced by gravitation for some time, he feels the weights growing heavier and heavier, till he can no longer bear them. On putting them down, when he feels he can bear them no longer, it appears to him as if he was impelled to mount straight upward, and as if the arms were shortened, and the hands must creep up to the thorax. Similar experiments with the muscles of the eye afford still more striking results. "If the face," says Purkinje, "be turned to the ceiling, and the eye be fixed on a given point, round which, as the pole of a vertical axis, the body is turned a certain number of times, the visible objects of the ceiling, as well as the floor of the room, will, if the position of the head and the direction of the eyes be maintained, appear to move in a horizontal direction. If, during the proceeding, the head be brought back into the ordinary upright position, the horizontal will be turned into vertical vertigo; and this sensation will be communicated to the tactile sense of the hands and feet, the floor appearing to sink down on one side, and to rise on the other."—See Rust's *Magazine*, etc., 1827, vol. xxiii. p. 290.

An analogous effect is produced by standing on the brink of, or in, a running stream, and fixing the eyes on the water; after a time, the sensation begins all at once of being borne along against the current. When this sensation comes on in wading in a river, it is very difficult to keep one's feet; and hence it is dangerous to let the eyes rest on the current close by.

Hitherto, we have spoken of vertigo, merely as a sensation; but there are certain

morbid conditions of the brain, and certain operations which experimental physiologists can perform upon it, that will give rise to what may be termed *vertiginous movements*, if we include under the term vertigo *straight* as well as circular movements, as is usually done by writers on this subject. From the experiments of Magendie and Flourens, which have been confirmed by Krauss and Hertwig, it follows that: 1. Removal of both corpora striata of the brain induces an irresistible tendency to advance, the animal shooting straight forward like an arrow; 2. Slicing the cerebellum, whether horizontally or vertically, causes the animal to walk backward; 3. Section of the corpora quadrigemina of one side, and of one side of the pons varolii, excites rotatory movements and gyrations of the animal toward the injured side; while division of the corresponding parts on the opposite side restores the balance. Vertiginous movements consequent on disease were described by the veterinary surgeons in sheep before they were noticed in the human subject. The *canurus cerebri*, which is now known to be the larva of a species of tapeworm (*tania canurus*) infesting the dog, is the well-known hydatid in the brain of sheep, producing in that animal the disease known under the various names of staggers, turn-sick, goggles, rotatory disease, etc. How this hydatid excites these movements when it destroys certain parts of the brain, is now explained by the experiments previously noticed. Dr. Romberg has collected a number of very interesting cases of vertiginous movements in the human subject.—On this subject, in addition to Romberg's work, the reader may consult a paper by Dr. Paget, "On Morbid Rhythmical Movements," in the *Edin. Med. and Surg. Jour.*, 1847, vol. lxxvii.; and the remarks of Dr. Carpenter (in criticism of some of Magendie's conclusions) on the cerebellum and its functions in his *human physiology*.

VERTNER, ROSA (GRIFFITH), now MRS. JEFFREY, b. Miss.; educated at bishop Smith's seminary, Lexington, Ky., in which place she has spent most of her life. She has written many poems, a collection of which was published in Boston, 1857. She has also written a novel *Woodburn*, (1864), and many tales and sketches.

VERTUE, GEORGE, distinguished as an English engraver and antiquary, was born in London in the year 1684, of poor but respectable parents. At the age of 13; he was set to study under an eminent French engraver there; subsequently, he became a pupil of Michael Vandergucht, with whom he remained seven years, and in 1709, he commenced business for himself. He was generously befriended by sir Godfrey Kneller, the great portrait-painter of the day, who did much to procure him employment. His talent soon made itself recognized; and his eminent success in an engraved portrait of archbishop Tillotson, for which he received a commission from lord Somers, at once placed him in the very front rank of his profession. In 1711, on the institution of the academy of painting, with his friend sir Godfrey Kneller as president, he enrolled himself as a member; but his contributions were few and unimportant. In his own more special department, he wrought through life assiduously, confining himself for the most part to reproductions of the portraits of Kneller, Richardson, and one or two others of the more eminent painters of the day. On the accession of George I., he issued a large engraved head of that monarch, which had an immense run, much increasing his reputation with the public. Himself, from an early period, devoted to antiquarian research, which from time to time he prosecuted in journeys hither and thither throughout England, he was appointed, in 1717, engraver to the society of antiquaries, in which capacity he worked up to the time of his death, which occurred on July 24, 1756. He lies buried in the cloisters of Westminster abbey. In addition to his eminence in his art, he was a man of considerable general accomplishment; an adept in drawing and music, and with a competent knowledge of the French, Dutch, and Italian languages. He projected a *History of the Arts in England*, and had accumulated masses of material for it. At his death, his manuscripts were bought by Walpole, who made free use of them in his *Anecdotes of Painting in England*. In a supplementary volume of that work, entitled *A Catalogue of Engravers who have been born or resided in England*, a full list of his works is given, with some interesting notices of his character, the genuine unassuming worth of which is indicated in an unaffected expression of respect, of rather more than usual significance, as coming from the caustic and supercilious Walpole.

VERTUMNUS. See POMONA.

VERULAM. See BACON, FRANCIS, *ante*.

VERVAIN (*Verbena*), a genus of plants of the natural order *verberacea*, with a 5-cleft calyx, one division a little shorter than the rest, the limb of the corolla irregularly 5-lobed, the stamens (4 or 2) included within the corolla, the fruit a 4-seeded utricle, which soon breaks, so that the ripe fruit consists of four adherent achænia. The species are herbaceous plants and small shrubs, with undivided, trifid, or multifid leaves, natives chiefly of the warmer temperate parts of the world. The common V. (*V. officinalis*) a perennial plant, with erect somewhat hispid stem, rough lanceolate inciso-serrate or trifid and lacinate leaves, and filiform spikes of pale lilac flowers, is a native of Britain and of most of the temperate countries of the world. It is a common ornament of flower-borders, continuing to blossom all summer. It had at one time a very high reputation as a medicinal plant, but its virtues are now regarded as imaginary. It has also been connected with some of the superstitious rites of different nations, as of the

Greeks and Romans, the ancient Persians, and the British Druids.—A number of species of vervain, chiefly American and East Indian, are occasionally cultivated for the beauty of their flowers.

VERVELS, or **VARVELS**, small rings attached to the ends of the jesses of a hawk through which the leash is passed that fastens the hawk to its block. They occur as a heraldic charge.

VERVICK, or **WERVICK**, a t. of Belgium, in the province of West Flanders, near the French frontier, on the Lys, 8 m. s.e. of Ypres. Pop. '70, about 6,800.

VERVIERS, a prosperous manufacturing town of Belgium, in the province of Liège, most picturesquely situated on the river Vesdre, 15 m. e.s.e. of Liège on the Brussels and Cologne railway. It is of recent growth; and being composed wholly of workshops and of the dwellings of the manufacturers and their workmen, there are no remarkable objects of attraction. Verviers is the great center of the second-rate cloth-manufactures in Belgium. In and around the town, there are 60 cloth-mills, employing 40,000 hands and 155 steam-engines. The exports of cloth to Switzerland, Italy, and America are valued at £1,000,000 a year; and the goods which are chiefly coarse woollens, are said to be better and cheaper than those of either France or England. The waters of the Vesdre possess qualities which render them admirably fitted for dyeing. Pop. '76, 37,828.

VERY, JONES, 1813–80, b. Mass.; graduated at Harvard college in 1836, and was Greek tutor there for two years. Besides frequent contributions to periodical literature, he published *Essays and Poems* (1839). As a writer of sonnets he is thought by many to have been unsurpassed in this country, and his critical writings, though like his poems, few in number, show learning and insight.

VESALIUS, **ANDREW**, the celebrated anatomist, was a native of Brussels, where he was born in 1514. He studied classics at Louvain, and anatomy and medicine first at Cologne, then at Montpellier, and finally at Paris, where his preceptors were Gunther, Sylvius, and Fernellius. So keen was his love of dissection that, in order to procure subjects (at that time no easy matter), he ran considerable risks at the hands of the municipal authorities. Driven from Paris by the outbreak of war between Francis I. and Charles V., he returned to the Low Countries, where he served as physician and surgeon in the imperial army from 1535 to 1537. In 1539 he went by invitation to Pavia, where he taught anatomy till 1543. From Pavia he went, again as a lecturer in anatomy, to Bologna and Pisa; and in 1544 was made physician-in-chief to Charles V. at Madrid, where he continued mainly to reside. He was now at the zenith of his prosperity, when an accident befell him which brought his career to a premature and disastrous close. A Spanish gentleman died in 1564, and permission to dissect the body was granted by his relatives to Vesalius. Life, however, was ascertained to be not quite extinct when Vesalius began the operation, the heart being found still palpitating. The family of the deceased, with inconsiderate vindictiveness, arraigned Vesalius before the inquisition, by which tribunal some terrible sentence would have been passed upon him, but for the interposition of Philip II., who procured for the unfortunate anatomist the milder penalty of an injunction to make a pilgrimage to the Holy Land. Vesalius, accordingly, in the train of the Venetian general Malatesta, proceeded to Cyprus, and thence to Jerusalem. While sojourning in that city, he was invited to occupy the chair of anatomy, just vacated in Padua by Fallopius. It is supposed that, in compliance with this invitation, he embarked for Europe; but the ship in which he sailed was wrecked on the shore of Zante. Hunger and misery of mind proved too much for him, and he died in a village of that island in 1564.

Vesalius was one of those men of science who contributed to disenchant the minds of his contemporaries from their servile belief in the ancients. Galen was then to anatomy what Aristotle was to logical method; and Vesalius assailed his authority by independent researches into nature. His first great publication was a series of anatomical tables entitled *Suorum Librorum de Corporis Humani Anatome Epitome* (Basel, 1542, fol.). The plates, from drawings by the best masters, and engraved on wood, were nearly all re-incorporated in his great work *De Corporis Humani Fabrica Libri Septem* (Basel, 1543). Great value is placed on the earliest impressions of these plates, the explanations of which, however, were revised by Vesalius in his second (Basel) edition in 1555. He published in 1546 his severe attack on the errors of Galen's anatomy, the well-known *De Rudicis Chirur. usu Epistola*. The cause of Galen was then espoused by Galen's disciple Fallopius, to whom Vesalius replied in his trenchant *Anatomicarum Gabrielis Fallopii Observationum Eramen* (1561). After his death, a work entitled *Chirurgia Magna*, published under his name, but really a compilation from the ancient anatomists, was edited by his disciple Borgarucci. The great edition of Vesalius's works appeared with fine plates at Leyden in 1725, 2 vols. fol., under the superintendence of Boerhaave and Albinus.

VESICANTS, or **BLISTERING AGENTS**, are substances which, if kept in contact for some time with the surface of the body, excite such irritation as to cause the effusion of serum from the true skin, leading to the separation and elevation of the cuticle, and the formation of a vesicle or blister. They are employed in the practice of medicine for the

purpose of relieving or removing the diseased condition of some internal part, by producing a determination of blood from the interior to the surface over the seat of the affection. They likewise are of great value from their action as general stimulants to the system, and as such are often used with great benefit in the advanced stages of low continued fever. Moreover, they are not unfrequently employed for the direct purpose of withdrawing serum from the vascular system, and with this view they are prescribed with advantage in cases of sudden effusion into the pericardium or the pleura. Blisters used with this object should be of large size, and should be kept in contact with the skin sufficiently long to produce their full effect (24 hours being in some persons necessary for that purpose). Lastly, vesicants are occasionally applied to the surface of the body, for the purpose of removing the cuticle, so as to permit the direct application of various medical agents (especially mercury and morphia) to the absorbing surface of the true skin. It must be recollected that in infancy and childhood, owing to the extreme readiness with which inflammation of the skin is then set up, these agents must be used with extreme caution.

To produce vesication, *cantharidine*—the active principle of *cantharides*, or Spanish flies—in one of its various forms is generally employed, although other substances, afterward to be noticed, are occasionally used. Cantharidine is a white crystalline substance, which is extracted from the powdered insects by rectified spirit, and whose composition is represented by the formula $C_{10}H_6O_4$. It is a very active poison, and produces immediate inflammation of the skin whenever it comes in contact with it, is very volatile, even at ordinary temperatures, and is soluble not only in alcohol, but in chloroform, ether, strong acetic acid, and many oils. This substance is employed in the form of plaster (*emplastrum cantharidis* of the *Pharm. Brit.*), blistering fluid (of which there are several excellent forms, such as *acetum canth.*, *ether canth.*, and *collodion canth.*, none of which are in the *Pharm. Brit.*), and blistering tissue (of which there are several forms, known as *tela vesicatoria*, *charta ves.*, *blistering cloth*,* etc., none of which are officinal). Although the fluids and tissues are the cleaner and neater preparations, the old-fashioned *cantharides plaster* is far the most commonly employed in general practice, and is, by many of the authorities in the profession (among whom we may name the late prof. Syme of Edinburgh, and prof. Lister, now of London), considered as the most efficacious (its superiority being due to its slower and more prolonged action). In prescribing a blister, it is expedient to sketch the size and shape desired. Before applying it, the skin should be well washed with warm water. If the patient's skin is not easily acted upon, the part should be sponged with vinegar; while if it is very susceptible, and he is liable to strangury from the application of blisters, a piece of tissue-paper should be placed between the skin and the plaster. (In speaking of the plaster, which is a solid mass, we assume that it is spread on some fitting material, as wash-leather, soft brown paper, etc., the popular idea of a plaster always including the material on which it is spread.) In order to insure close contact with the skin, the blister should be gently warmed, carefully applied, so as to avoid creases, and kept in its place by a bandage. To produce their full action, blisters should remain from ten to twelve hours, and if on their removal after that time full vesication has not been produced, a hot bread-and-water poultice will often produce the desired effect. The raised cuticle should be punctured, to allow of the escape of the serum (except in the case of children and persons of very irritable skin, when the vesications should be left unopened), and a dressing of simple ointment or spermaceti ointment on soft rag applied, and repeated in twenty-four hours afterward; or the part may be at once covered with cotton-wool, which until it gives off a bad smell, can remain till the skin is healed. The troublesome *itching* which often follows the application of a blister, is best relieved by the application of a bread-and-water poultice, moistened with the dilute solution of acetate of lead, formerly known as Goulard's *vegeto-mineral water*. Dr. Neligan, in his highly practical work *On Medicines*, speaks so strongly of *collodium vesicans* as a blistering agent, that although we have no personal experience of it, we shall, on his authority, briefly notice it. It is prepared, when required, by mixing together equal parts of collodium and cantharidal ether (obtained by digesting for three days one part of coarsely powdered cantharides in two parts of sulphuric ether, and expressing). It possesses the advantage that its strength can be readily increased or diminished. "It is now much used for blistering," he observes "owing to its cleanliness, its certainty, and the facility with which it may be applied in the neighborhood of joints, or to other parts which are difficult to blister by the ordinary method. It is applied with a camel-hair pencil; two scruples are sufficient to blister a surface as large as the palm of the hand. It is preferable to apply the quantity to be used twice, instead of at one time, on the place to be blistered."

When a blistering agent with very rapid action is required, as in the state of collapse in cholera, recourse may be had to the application of boiling or nearly boiling water † to

* We have not included the well-known *papier d'Albepespyres*, which is often sold for this purpose, because it is not sufficiently powerful. It is useful for keeping open an already blistered surface.

† Strange and paradoxical as it may appear, "in the absence of other more suitable means, *cold water* may be used as efficiently as boiling water, and will not present so formidable an appearance to the patient. A piece of bibulous paper (common blotting-paper, for example) should be soaked in cold water, applied to the part to be vesicated, and covered with three or four folds of dry paper. A common smoothing-iron heated to 212° should now be pressed three or four times over all, and on removing the paper, the part will be found vesicated."—Neligan, *op. cit.*, p. 325.

a portion of the abdomen, the surrounding surface being protected by a wall of damp cloth; or in less urgent cases, as retrocedent gout showing itself internally, an almost immediate blister may be produced by saturating a piece of lint of the size of the desired blister in the strong solution of ammonia, and applying it to the skin with moderate pressure. By the time that the ammonia has evaporated, the required result is usually obtained. When it is desired to keep up a discharge from a blistered surface (instead of healing it, as is most commonly required), or to produce a *perpetual blister*, we dress the raw surface with irritants of various kinds, such as savine ointment, *papier d'Albepreyres*, etc. At each fresh dressing, which in summer should take place twice a day, the part should be cleansed with warm water.

VESICA PISCIS (barbarous Lat. bladder fish, bladder evolved out of a fish), a term often, but not very correctly, used for the aureole or glory, of a pointed oval shape, formed by the intersection of two circles, which, in the religious symbolism of the early middle ages, is often represented encircling the whole body of the Saviour. This form is supposed to have been gradually evolved out of the figure of the fish, which is prominent in the symbolism of the early Christians on sarcophagi and elsewhere, and whose use arose out of an anagram on the initial letters of *Ἰησοῦς Χριστὸς Θεοῦ Υἱὸς Σωτὴρ*, Jesus Christ, son of God the Saviour. The ovoidal form, generally designated by English antiquaries the *Vesica Piscis*, is much used in painted glass, and became from the 12th c., the almost invariable form of the seals of ecclesiastical persons and institutions.

VESOUL, a small t. in the e. of France, capital of the dep. of Haute-Saône, stands in a fertile and picturesque country, overlooked by the mountain called the *Motte-de-Vesoul*, on the Durgeon, 236 m. e.s.e. of Paris. The manufactures of the town are unimportant, but the environs are as fertile as they are beautiful; the slopes of the *Motte-de-Vesoul* are clad with vines; and a trade in grain, hay, and hides is carried on. Pop. '76, 9,097.

VESPASIANUS, **TITUS FLAVIUS**, Roman emperor, was a native of Reate, in the Sabine country, of humble origin. After serving with distinction in various military grades in Thrace, Britain, and Africa, he was sent by Nero to conduct the Jewish war. This appointment he owed to his recognized merits, for he was not a favorite with the emperor, whom he had offended by falling asleep during the recitation of one of his poetical compositions. He conducted the war with vigor, reduced Judæa, and finally laid siege to Jerusalem. At this time occurred the struggle for the imperial dignity between Otho and Vitellius, after the murder of Galba. The legions serving in the east were indignant that the empire should be disposed of at the will of the pretorian guards. Their own gen. was proclaimed emperor, and quickly acknowledged as such by all the east, and, after the death of Vitellius, by Italy and all the provinces. Leaving his son Titus to prosecute the siege of Jerusalem, he repaired to Rome, where he was joyfully received, and immediately set about the work of restoring order. He kept his soldiers under firm discipline, improved the finances, co-operated cordially with the senate in the administration, and did much by his example to lessen the ill effects of the prodigality and luxury of his predecessors. An interesting biography of him has been written by Suetonius, and from the personal anecdotes there recorded, we are enabled to estimate clearly the character of the man. He was simple and unostentatious in his mode of life, too shrewd to listen to flattery, liked a joke, was good humored, and easy of access. He is charged with being avaricious, and at times he certainly sought to obtain money by rather undignified ways; but though niggardly in personal expenditure, he was lavish in embellishing the city with public works, and a munificent patron of the arts and sciences. He is chargeable also with one or two acts of cruelty, but usually he bore provocation with great good temper. He died 79 A.D., in the 69th year of his age, after a reign of 10 years.

VESPER (Lat. *vespere*, in the evening), one of the canonical hours of the breviary, called also anciently *lucernarium*, from *lucerna*, a lamp. It is a service of very ancient use, being plainly referred to in the apostolical constitutions, and is noticeable as that one among the canonical hours which in the Roman Catholic church continues to be regularly sung as one of the ordinary public services of parish churches, no less than in cathedrals where the entire of the hours are chanted. It resembles lauds, and consists of five psalms and antiphons, a lesson, a hymn with versicle and response, a canticle (the magnificat), and a collect or prayer. The psalms sung at vespers are Ps. cix.-cxlvii., which are distributed over the several days of the week. The service of vespers has given occasion to some of the most brilliant efforts of modern musical composers. The evening prayer of the English prayer-book corresponds partly with the vespers, partly with the compline (*completorium*) of the Roman breviary.

VESPERTILIONIDÆ, one of the four families of the insectivorous section of bats, comprising the ordinary bats of the old and new world, and distinguished by having a dentition much like that of other insectivorous mammals, the molar teeth being furnished with cusps adapted for crushing insects, and the incisors small. The nose has no leaf-like appendages. The tail is elongated and inclosed in a large membrane extending between the thighs. The family has a wide range, embracing most of the species of northern temperate countries. It has been divided into about 20 genera, by far the most extensive of which is *vespertilio*. See **BAT**, *ante*, and **NOCTILIONIDÆ**.

VESPUCCI, AMERIGO. See **AMERIGO VESPUCCI.**

VESTA—VESTALS. Vesta, an ancient Latin divinity, whose worship was the embodiment of an idea deeply rooted in the Latin, and particularly in the Roman mind—viz., that the state was one great family. As the Lares were the tutelary guardians of the individual household, so the Penates and Vesta watched over the welfare of the state. The Greek *hestia* (hearth) is a kindred conception; and if the word is the same, it may be conjectured that the worship of the chaste divinity that presided over domestic life goes back to a period when the Greeks and Latins were still an undivided people. The state, we have said, was regarded by the Latins as one great family, so each community had its public altar to Vesta, the central one for the whole Latin people being at Lanuvium, about 20 m. from Rome, on the Appian way, where the Roman consuls and other officers offered sacrifices on entering upon their offices. The common hearth of the Greeks was at Delphi. There was also a temple of Vesta at Rome, which stood in the forum, near the temple of the Penates (see **LAES**, etc.), between the Palatine and Capitoline hills; it was open during the day, and closed during the night. On the first of March each year, the sacred fire was renewed; on June 9, the *vestalia* were held in honor of the goddess; and on the 15th of that month, the temple was cleared out, and the dirt carried into a narrow lane (*angiportus*) behind the temple, which was locked by a gate, that none might enter.

The goddess herself was a virgin, and her fire was carefully tended night and day by the *Vestal* virgins. The number of these priestesses was originally four, but two were subsequently added, increasing the number to six. At first, they were chosen by the kings; but after their expulsion, by the pontifex maximus, who, when a vacancy had to be filled up, selected twenty damsels between the ages of six and ten years, from among whom one was chosen by lot. A father could offer his daughter for the office, if he chose, but this seldom happened. The necessary qualifications for the office of Vestal were, that the maiden should be the daughter of free-born parents, then alive and resident in Italy, and engaged in no dishonorable occupation; that she herself should not be younger than six, nor older than ten years, and free from any physical defect. The period during which the priestess was bound to the service of Vesta was thirty years, the first ten being occupied with learning her duties, the next in performing them, and the last in teaching them to others. When she entered upon her office, the Vestal took upon herself a solemn vow of chastity for the thirty years of her service, the dreadful punishment of a violation of which was, that she should be buried alive in a subterranean vault near the Colline gate, to which she was carried on a bier, as if dead, and where she found a light, with a scanty supply of bread, water, milk, and oil. The chief duty of the virgin priestesses was to keep the fire on the altar of the goddess ever burning; they had also to present offerings to Vesta, sprinkle the temple every morning with water drawn from the Egerian well, and guard the sacred relics, which were a pledge granted by fate for the permanency of the Roman sway. As the extinction of the sacred fire was looked upon as emblematic of the extinction of the state, the Vestal who, by neglect of duty, allowed this to happen, was severely punished, the penalty being, that she should be stripped and scourged by the pontifex in the dark; the fire was again rekindled by the friction of two pieces of wood from a "lucky tree."

As a compensation for the strictness of the lives which they had to lead, the Vestals had many privileges bestowed upon them; among others, they were entirely freed from paternal authority; could make a will, and give evidence without taking an oath; had a seat assigned them in the best part of the theater; were held in the greatest honor, and done homage to by the highest officers of the state; and even the plebs, in their most reckless moments, respected them. If, when out walking, their eye should chance to light upon a criminal, he was set free. At the expiration of her period of service, a Vestal, if she chose, could marry, although to do so was considered very unlucky, so that she generally ended her days in the service of the goddess.

VESTIBULUM, a porch or ante-room, from which a house or large apartment is entered.

VESTMENTS, SACRED, the peculiar habiliments worn by ministers of religion in the public discharge of their office, and sometimes in other sacred ministrations, even when privately performed. The use of a distinctive costume in public worship formed a part not only of the Jewish, but of almost all the ancient religions, and has been found in a greater or less degree in the religions of the new world. See Lipsius, *De Monument. et Exemp. Polit.*, l. i. c. 3. The whole 28th chapter of Exodus is taken up with a description of the vestments of the high priest; and the directions for those of the inferior functionaries are almost equally minute. Whether the same characteristic was carried into the early Christian worship, has been a subject of controversy; some, writers being of opinion that the peculiar sacred costume which we find in use among Christian ministers from a very early period was not originally peculiar to the clergy, but was simply the ordinary costume of Rome and of the east in the first centuries, and only came to be a costume distinctive of sacred ministers, because by them it was retained unaltered, whereas in the every-day world the costume varied in fashion, in material, in color from year to year. There seems little room, however, for doubting, that from a very early time Christian ministers did employ some distinctive dress in public worship; and Cath.

olic writers even find traces in the beginning of the 5th c. of the practice of blessing the vestments which were destined for the public services of the church. See Binterim, *Denk-schilderungen*, IV. i. p. 198. From the 8th c. downward, the rituals of the west all contain formularies for the blessing of the several sacred vestments worn by bishops, priests, deacons, and lower clergy. The vestments used in the celebration of the mass by priests of the Roman Catholic church are six in number,—viz. (1) the amice, a square piece of linen, which is worn upon the shoulders, and in some of the religious orders, over the head, which latter, indeed, appears to have been the ancient mode of wearing it; (2) the alb, a long, loose-sleeved, linen gown, sometimes richly embroidered or “apparelled” at the lower border; (3) the cincture, a linen cord tied around the waist, and confining the folds of the alb; (4) the maniple, a narrow strip of embroidered silk, worn pendent from the arm; (5) the stole, a long narrow scarf, similarly embroidered, and worn by priests around the neck, the ends being crossed over the breast or pendent in front, and by deacons transversely over one shoulder; (6) the chasuble, a loose flowing vestment, open at the sides, having a hole in the center, through which the head passes, and falling down over the breast and back to some distance below the knees. Most of these vestments have been already briefly described. The three last named are always of the same material and color; but this color, which appears primitively to have been in all cases white, now, and for many centuries, varies according to seasons and festivals, five different colors being employed in the cycle of ecclesiastical services—viz., white, red, green, violet, and black. Cloth of gold, however, may be substituted for any of these, except the last. A cap, called *biretum*, is worn in approaching the altar, but is laid aside during mass. Besides these vestments, which are worn by priests during the mass, bishops in the same service use also two inner vestments, of nearly the same form as the chasuble, called “dalmatic” and “tunic,” as also embroidered gloves and shoes, or buskins, together with the distinctive episcopal ornaments—the pectoral cross, the miter, the pastoral staff, or, if archbishops, the crosier, and ring. Archbishops celebrating mass also wear the *pallium* (q.v.). Deacons, at the same service, wear a robe, called dalmatic, and sub-deacons, a tunic. The sub-deacon is not privileged to wear the stole. In other public services, priests and bishops wear a large flowing cloak, called cope (Lat. *pluviale*), with a pendent cape or hood, called orfrey. In the ministration of the other sacraments, and also in administering communion, priests wear the surplice (which is but a short alb) with the stole. The vestments of the Greek priests differ considerably in their general character and effect from those of the Latin clergy, but the several portions of the costume are substantially the same as those of the Latin costume already described. The *stocharion*, the *zoné*, the *orarion*, the *epimanikia*, and the *pheloron*, correspond respectively with the alb, cincture, stole, maniple, and chasuble. Greek bishops wear the *omophorion*, which corresponds with the later pallium. The *pheloron*, however, is so ample in its folds as to resemble the Latin cope rather than the chasuble; and the general effect of the Greek vestments, which may be said to resemble in all particulars that of the other eastern rites, is much more picturesque.

The natural effect of the religious changes of the 16th c. was to put aside the costume at the same time and on the same grounds with the ceremonies of the existing worship. This was done, however, by the different churches of the reformers in very various degrees. The Calvinistic worship may be said to have dispensed with vestments altogether. The Lutherans generally retained with the cossack the alb, and in some countries the chasuble. In the English church a variety of practice has existed. The disputes about the use of the surplice (q.v.) have been already described. As to the rest of the costume, the first prayer-book retained the Roman vestments with little change; and as, by a remarkable accident, the rubric of this prayer-book has never been formally repealed, a so-called ritualistic movement in the English church has re-introduced in some places almost every detail of the Roman costume in the communion and other services, an innovation which has in many instances been vigorously resisted.

VESTRIS, the name of a family of dancers of Italian origin. The most famous of them was MADAME (BARTOLOZZI), 1797-1856; b. London; wife of the dancer AUGUSTE ARMAND VESTRIS. She made her first appearance in opera in 1815. She was afterward a successful English actress and contralto singer. Her second husband was the younger Charles Matthews. GAETANO APOLLINO BALDASSARE (1729-1808; b. Florence) and MARIE AUGUSTE (1760-1842; his natural son) were famous opera dancers in their time.

VESTRY, in English parishes, is a meeting of the inhabitants of the parish assembled to deliberate on some matter which they have a right to decide (see PARISH). The vestry is the regular organ through which the parish speaks; and in numerous matters relating to church-rates, highways, baths, and wash-houses, and other sanitary matters, it has important functions to discharge, and is a conspicuous feature of parochial management. A statute was passed in 1818 to regulate the mode of procedure. No vestry, or meeting of inhabitants in vestry, shall be held until public notice of the place and hour of meeting be given, as well as of the special purpose of such meeting. This notice is required to be given by publishing it on some Sunday before the celebration of divine service, by affixing a written or printed copy on the principal door of the parish church or chapel. Such notice is to be previously signed by a church-warden of the church or chapel, or by the rector, vicar, or curate of the parish. These meetings were formerly

held in the vestry-room of the church, hence the name given to the meeting itself. In large parishes the vestry-room of the church was found too small; and wherever the population exceeds 2,000 the vestry may apply to the poor-law board to have some room, or other place of meeting than the church, built or hired for the purpose of the vestry-meetings. The minister of the parish—that is to say, the rector, vicar, or perpetual curate—if he be present, is entitled to be the chairman; but if he be not present, then the meeting may nominate one of the inhabitants to be chairman. The chairman has the power of adjourning the meeting, but he must exercise such power prudently, and so as to facilitate the business. None but persons rated to the relief of the poor can vote in a vestry; and though formerly none could vote unless actually residing in the parish, this is no longer necessary, provided the person is rated to the poor of the parish. The number of votes depends on the rental or value of the occupation, one vote being allowed for each £25 of value, or rental, provided that no person shall have more than six votes. In case of joint-occupiers, each votes according to his own share of the joint value. One of the incidents of holding a vestry is that any vestryman, after a show of hands is taken, may demand a poll, and if the poll be refused, the resolution come to is void. The law has surrounded this parochial right to a poll with jealous care; and if there is not fair play given, and ample notice and time for all the inhabitants entitled to vote to come and give their vote, the whole proceedings are void. It is the duty of the church-wardens and overseers to keep a book in which to enter the minutes of the vestry. The vestry appoints annually church-wardens and highway surveyors. While church-rates were compulsory, a church rate could only be made by a vestry; and if the majority choose to make none, then no rate was possible. The vestry also deliberates and resolves as to stopping up, diverting, or turning highways; whether the owners of small tenements ought to be excused from paying poor rates; whether baths and wash-houses, parish libraries, etc., shall be adopted. In large parishes a vestry-clerk is usually appointed, and paid out of the poor-rate; and in such case he is appointed by the vestry. His duty is to give notices of all vestry-meetings; to summon the church-wardens and overseers; to keep the minutes, accounts, and vestry-books; to make out the church-rate; recover arrears of rates; make out lists of persons qualified to act as jurymen, and to give notices for claims to vote for members of parliament. Some parishes are governed by a select vestry, which means a small part of the chief inhabitants appointed by justices of the peace under a statute, and their duty consists of relieving the poor, and they supersede the common vestry of the parish.

VESUVIAN, or **IDOCRASE**, a mineral allied to garnet, and sometimes called *pyramidal garnet*. It is found in volcanic and in primitive rocks. It is frequent in masses ejected from Vesuvius, whence its name. The hardness is about equal to that of quartz. The colors are various—yellow, green, brown, almost black, rarely azure. Vesuvian is composed of silica, alumina and lime, in somewhat varying, but not very unequal proportions, with a little oxide of iron and oxide of manganese. It is employed as an ornamental stone, but is not very highly valued. The green-colored varieties are known as *volcanic chrysolite*, and the brown as *volcanic hyacinth*.

VESUVIUS, a well-known volcano, is situated near the e. shore of the bay of Naples, about 10 m. from the city of that name. It is a solitary mountain, rising majestically from the plain of Campania, having at the base a circumference of about 30 m., and dividing, at a certain height, into two summits, Somma and Vesuvius proper. The height of the mountain and form of its apex are subject to frequent changes by eruptions. It is estimated to be at present nearly 4,000 ft. high. In the single eruption of 1822 it lost 800 ft., nearly all of which has been restored by subsequent eruptions. Before that event, the summit was a rough and rocky plain, covered with blocks of lava and scoriæ, and rent by numerous fissures, from which clouds of smoke were given out. But it was then altered to a vast elliptical chasm, 3 m. in circumference, three-quarters of a mile at the greatest diameter, and about 2,000 ft. deep.

The first recorded eruption took place in the year 79 A.D. Warnings had been given sixteen years before by a great earthquake, which shattered the cities of Herculaneum and Pompeii, and the earth was frequently shaken by slight shocks until August of the year 79, when they became more numerous and violent. Previous to this, Vesuvius was not suspected to be a volcano. Its sides were covered with famous vines, and its ancient crater, partly filled with water, formed the stronghold of the rebel chief, Spartacus. The morning of Aug. 24 brought comparative repose; but in the course of the day, a huge black cloud rose from the mountain, from which stones, ashes, and pumice were poured down on all the region around. The elder Pliny, who commanded the Roman fleet at Misenum, sailed to the help of the distracted inhabitants: he landed near the base of the mountain, was enveloped in sulphurous vapor, and was suffocated. The younger Pliny gives a graphic account of the eruption in two letters to Tacitus, which are well known. No lava was ejected on this occasion, nor indeed in any eruption in historic times up to the year 1066. Pompeii was buried under a thickness of 20 ft. of loose ashes, and remained unknown until about a century ago. A torrent of mud spread over Herculaneum, which, by additions from subsequent repeated eruptions, now forms a thickness of 80 or 100 feet. Since this first famous eruption, Vesuvius has been an active volcano, and has been frequently but irregularly in eruption, about 60 great

and numerous smaller ones having taken place. In 472 the eruption was so great that the ashes fell even at Constantinople, and caused great alarm there. The summit known as Monte Nuovo was, in 1538, forced up in two days to the height of 413 ft., and with a circumference of 8,000 feet. In 1631 the villages at the foot of the mountain were covered with lava, and torrents of boiling water were sent forth. Since that described by Pliny, one of the most famous is the eruption of 1779, of which sir William Hamilton, then British minister at Naples, gives an interesting account. In the spring of that year it began to pour forth lava; this was succeeded by rumbling noises and puffs of smoke; then jets of red-hot stones and ashes made their appearance, and increased in number and intensity, until the eruption arrived at its climax between Aug. 5 and 10. Then enormous volumes of white clouds rose from the crater to a height four times that of the mountain, and lava poured from the crater in torrents down the sides of the cone. This was followed by columns of fire, which rose on some occasions to three times the height of Vesuvius, or more than two miles. In the midst of all this, showers of stones, scorie, and ashes were thrown out to a great height. One mass of rock ejected was 108 ft. in circumference, and 17 ft. high. A more terrible eruption took place 15 years later, by which the greater part of the town of Torre del Greco was destroyed. The violent eruption of 1822 has already been alluded to. A remarkable eruption occurred in May, 1855. In 1865 began a series of eruptions, which have been repeated at intervals since. For a full account of the fearful outbreak of April, 1872, we are indebted to Palmieri, director of the meteorological observatory on mount Contaroni, a part of Vesuvius, who with great courage remained in the observatory while it seemed threatened with destruction. An eruption equal in brilliancy to that of 1872, but much less destructive, took place in 1878.

VESZPRIM (Ger. *Weisbrunn*), a t. in the w. of Hungary, and 70 m. s.w. of Pesth. It contains a handsome episcopal palace, a fine cathedral, a Piarist college, gymnasium, and an institution for decayed or disabled priests. Cloth and flannel weaving, silk-spinning, the cultivation of wine, fruits, and tobacco are the principal industries; but coal-mining, iron-works, large cattle-markets, and general trade are carried on. The town has been on several occasions in the possession of the Turks; and an interesting memorial of them is a slender minaret, which rises from an old Gothic tower, and which now serves as a watch-tower against fire. Pop. '69, 12,002.

VETCH, *Vicia*, a genus of plants of the natural order *leguminosæ*, suborder *papilionaceæ*, having a tuft of hairs on the style beneath the stigma, nine stamens united, and one free. To this genus the *bean* (q.v.) is generally referred. The species, however, are mostly climbing plants, annuals, with pinnate leaves ending in tendrils, and with no terminal leaflet. A number of species are natives of Britain. The common vetch (*V. sativa*), sometimes called by agriculturists **TARE**, frequent in cultivated ground in Britain and throughout Europe, and itself much cultivated as green food for cattle, has rather large purple, blue, or red flowers in pairs, axillary and almost sessile. In cultivation it varies considerably both in size and other particulars, as in the breadth of the leaflets, the number of them in a leaf, etc. Oats are generally sown along with it to afford it a little support, and thus prevent its rotting in wet weather.—*V. cracca* and *V. sepium* are very common British species, the former with many-flowered stalks, bearing beautiful bluish-purple flowers, being one of our most beautiful climbing plants, and a chief ornament of trees, hedges, and bushy places in the latter part of summer. These and other species, natives of Britain or of different parts of Europe and the n. of Asia, have been either occasionally cultivated as food for cattle or recommended for cultivation, and generally agree with the common vetch both in their qualities and in the mode of cultivation which they require. *V. biennis* and *V. narbonneusis* are among those chiefly cultivated in some parts of Europe. The species of vetch are very numerous, chiefly in the temperate parts of the northern hemisphere.

VETCH, BITTER. See **OROBUS**.

VETCHLING. See **LATHYRUS**.

VETERAN CORPS are among the military reserves of all nations. They consist of old soldiers past the prime of active manhood, and incapable of taking the field. Their discipline and steadiness, however, admirably fit them for garrisons or fortresses, and for the instruction of young troops. The veteran battalions did good service during the French war as home guards, releasing the active troops for foreign service. The army estimates for 1879-80 made provision for an army reserve (including pensioners) of 46,000 men. But from the short periods during which men serve as soldiers, and the number of officers who quit the army on reaching the rank of captain, it is almost certain that very large veteran corps could be formed from civil life in any case of national emergency.

VETERAN RESERVE CORPS, in the United States, an organization established during the rebellion, but now discontinued. It was composed of men honorably discharged on account of wounds or disabilities, of men absent from their colors in hospitals or convalescent corps, and of men disabled by wounds or disease, but still in the field. In May, 1865, the body consisted of 762 commissioned officers and 29,852 men. The duties of the veteran corps were varied, and included such work as hospital and gar-

risson service and patrol duty. They were serviceable in taking the place of efficient soldiers who were needed in the field.

VETERINARY MEDICINE (Lat. *veterina*, beasts of burden; probably for *vehiterina*, from *veho*, to carry) embraces the medical management of the domestic animals, and appears to have been studied by the ancient Egyptians as well as by the Greeks and Romans. Hippocrates contributed a treatise on equine disorders; Columella and Vegetius (the latter of whom flourished about 300 A.D.) have left several curious veterinary works. Until after the middle of the 18th c. there were, however, no schools for the teaching of veterinary science or art. The several works published in France, Italy, and elsewhere were not of great value. In this country, Blundeville and Geivase Markam, who lived in the reign of Elizabeth, published volumes on farriery; Snape, farrier to Charles II., produced an anatomical treatise on the horse; Mr. Gibson, previously a surgeon in a cavalry regiment, paid much attention to the disorders of animals, and about the middle of last century published *The Farrier's Guide*, which continued for many years the best authority on the subject. The treatment of sick horses remained, however, in the hands of the riding-master, the groom, or the shoeing-smith, or farrier (from *ferrum*, iron); while the doctoring of the other domestic animals devolved upon the goat-herd, shepherd, or cow-leech.

Veterinary medicine, as a scientific art, takes date from 1761, when the first veterinary college was established at Lyons with royal patronage, under the able teaching of Bourgelât. Five years later the flourishing school of Alfort, near Paris, was founded. In Feb., 1791, the London college was organized, Charles Vial de St. Bel being appointed principal, with Delabere Blaine as assistant-professor. St. Bel died in 1793, and was succeeded by Mr. Coleman, who, during many years, zealously improved the position and teaching of the college. In Scotland lectures on veterinary medicine were first given by Mr. Dick in 1819. Under the auspices of the Highland and agricultural society, and *senatus academicus*, Mr. Dick in 1823 began his systematic teaching of veterinary surgery. Soon afterward he erected the college buildings in Clyde street, Edinburgh, with hospital for sick animals; he collected a valuable museum; extended the curriculum of study; and engaged efficient assistants, among whom were John Barlow and Dr. George Wilson, to instruct his pupils in anatomy and physiology, chemistry and *materia medica*, cattle practice and histology. At his death in April, 1866, Mr. Dick bequeathed to the city of Edinburgh the college which he had founded, and his entire fortune, to be devoted to the teaching and improvement of veterinary medicine. For many years upward of 80 professional pupils, with a number of agricultural and amateur students, have annually attended the classes at the Edinburgh veterinary college. About 150 are enrolled at the Camden Town college, London. In 1857 Mr. John Gamgee established the new veterinary college in Edinburgh, which existed till 1863, when Mr. Gamgee went to London. The new veterinary college, Gayfield house, Edinburgh, was established by principal Williams, and recognized by royal sign manual in 1873. Since 1861 a veterinary school has been conducted in Glasgow by Mr. James Macall. An attendance at one or other of these colleges, during three sessions of six months each, and two sessions of two months, is required before a pupil can present himself to be examined for his degree. At the best continental schools four years study is usually necessary. The fees for the whole curriculum at the different educational establishments are about 36 guineas. At all the colleges—at London by the college of preceptors; at Edinburgh by the rector of the Royal high school and mathematical master; at Glasgow by the principal of the college—a preliminary examination is now required.

In 1844 a royal charter was granted under which veterinary surgeons (graduates of either the London or Edinburgh college) became a corporate body, entitled "The Royal college of veterinary surgeons," with authority to appoint examining boards, and grant diplomas or licenses to practice. In 1876 a supplementary charter was obtained, empowering the Royal college of veterinary surgeons to grant the higher title of fellow, without examination, to the most eminent members of the profession who had been fifteen years in practice, and to appoint a board to examine candidates for the fellowship degree, each candidate to have been five years in practice. Nearly 3,000 persons now hold these diplomas, which cost £10 10s., and constitute the holder a member of the Royal college. For nearly fifty years the Highland and agricultural society of Scotland have annually appointed an examining board, consisting of medical men and skilled veterinarians; and at the cost of £2 2s., have granted to pupils who have studied for two sessions at the Edinburgh veterinary college, a certificate, which has been fully recognized as a guarantee of professional ability by the public, and by the authorities at the horse guards and India office. The profession having obtained the supplementary charter by which many grievances have been removed, the Highland and agricultural society and the Royal college of veterinary surgeons are now on the point of completing an arrangement, the result of which will be the abolition of the society's examination, and the admission of its present certificate-holders as members of the Royal college without examination. In many English towns and districts there are veterinary practices worth from £600 to £1000 a year; while in London, Manchester, and elsewhere, the receipts of a few exceed that amount.

The literature of veterinary medicine is rapidly widening. Mr. Percivall and Messrs.

Gamgee and Law, and the late prof. Strangeways, have published text-books on anatomy. The chief reliable authorities on diseases consist of Mr. Dick's excellent little manual of veterinary science; Percivall's *Hippopathology*, in 3 vols.; Mr. Gamgee's *Domestic Animals in Health and Disease*; F. Dun's *Veterinary Medicines, their Actions and Uses, with an Appendix on Diseases of Animals*; Tuson's *Pharmacy*. Late important contributions are prof. Williams's *Principles and Practice of Veterinary Surgery* (Edinburgh, 1872); and *Principles and Practice of Veterinary Medicine* (Edinburgh, 1874), which have now reached their third and second editions. Mr. Fleming, v.s., r.e., has translated M. Chaveau's elaborate treatise on the *Anatomy of the Domesticated Animals* (1873); has published *Sanitary Science and Police*, 2 vols.; *Rabies and Hydrophobia*; *Animal Plagues*; *Veterinary Obstetrics*; and founded *The Veterinary Journal*. The *Veterinarian*, a monthly periodical, has been published for many years.

VETERINARY SURGEON (army), an officer of a cavalry regiment, or in the artillery, who is charged with the supervision of the horses, and with their cure, if in need of medical aid. A veterinary surgeon is required to produce proper testimonials of qualification, and to pass an examination. On appointment he receives 10s. a day, and ranks as lieutenant. By service his pay rises to £1 3s. a day, and his relative rank to that of major. After 25 years' service he becomes entitled to retire on half-pay.

VETHAKE, HENRY, LL.D., 1792-1866; b. Essequibo, South America; came in youth to the United States; graduated at Columbia college, 1808; studied law; was a teacher of mathematics and geography in Columbia college, 1813; professor of mathematics and natural philosophy Rutgers college, 1813-17; at Princeton, 1817-21; Dickinson college, 1821-29; university of New York, 1832-35; president of Washington college, Va., 1835-36; professor of mathematics, university of Pennsylvania, 1836-54; provost, and professor of mental and moral philosophy, 1854-59; professor of higher mathematics in the Philadelphia polytechnic college, 1859. He published *Principles of Political Economy*; edited *Supplementary Volume of Encyclopædia Americana*, most of the articles of which he wrote; edited and enlarged McCulloch's *Dictionary of Commerce*.

VETIVER, or CUSCUS, the dried roots of an East Indian grass (*Andropogon muricatus*), which has a very agreeable and persistent odor, something like sandal-wood. It is much prized in India and other parts of the world, and is used to perfume linens, etc. Baskets, fans, and mats are made of it in India; it is remarkable for giving out its perfume for many years, and it is stongest when moistened.

VETO, in politics, the power which one branch of a legislature of a country may have to negative the resolutions of another branch. In the United Kingdom, the power of the crown in the act of legislation is confined to a veto—a right of rejecting, and not resolving. The crown cannot of itself make any alterations in the existing law, but may refuse to sanction alterations suggested and consented to by the two houses of parliament. The necessity for such refusal is generally obviated by an observance of the constitutional principle, that the will of the sovereign is that of the responsible ministers of the crown, who only continue in office so long as they have the confidence of parliament. The royal veto is reserved for extreme emergencies; the last instance in which it was exercised was in 1707, when queen Anne refused her assent to a bill relating to the militia in Scotland. The house of lords will generally support the prerogative of the crown by rejecting a measure repugnant to the sovereign; and a knowledge of this may enable the ministry to defeat it in the house of commons—a result which the constitutional influence of the crown and the house of lords in the lower house may assist in producing, so as to avoid a collision between the branches of the legislature. In bills of supply, the power of the house of lords amounts merely to a veto, as does that of the house of commons in bills affecting the peerage.

In the United States of America, the president has a qualified right to veto all laws passed by congress; but after that veto has been exercised, the bill which he has rejected may become law by being passed by two-thirds of each house of congress. For the Polish *liberum veto*, see POLAND.

In the French constitution of 1791, it was resolved to have but a single house of legislature, on the principle that it was inconsistent with the idea of a legislature representing the national will that one part of it should have a veto on another, and the same view was adopted by the convention of 1793. But the arbitrary and violent measures of that latter body induced a strong general conviction that a division of the legislative power, and a veto in some form, was essential to give stability to the government, and moderation to faction; and in the constitution of 1795, a council of ancients was introduced, with a power to veto the resolutions of the legislative body.

VETO (*ante*). By the U. S. constitution power is given the president to "veto" any act of congress by refusing to sign the bill after its passage. If he adopt this course the bill is returned to the house in which it originated with the president's objections to signing it. The house then may proceed to reconsider the act, and if the act pass both branches by a two-thirds majority, it becomes law. A similar power is exercised by the governors of the states under the state constitutions. The U. S. constitution also provides that "if any bill shall not be returned by the president within ten days (Sunday excepted) after it shall have been presented to him, the same shall be a law in like man-

ner as if he had signed it, unless the congress by their adjournment prevent its return, in which case it shall not be a law." This power of the president to prevent the enactment of a law presented to him within the ten days before the adjournment of congress, without sending in a refusal to sign or objections, is commonly known as the "pocket veto."

VETO ACT, in Scottish ecclesiastical law. See **PATRONAGE**; **SCOTLAND**, **CHURCH** OF.

VEUILLOT, LOUIS, French journalist and author, b. in 1813, at Boynes en Gatinais (Loiret). The son of a small cooper, he was sent to a school near Paris, from which he was transferred in 1826 to a lawyer's office. He chose the profession of journalism, and filled several engagements on the provincial press, in the course of which his personalities involved him in various duels. He visited Rome in 1838, previous to which, he states, he was without much faith, either religious or political. He returned to Paris, however, a zealous adherent of the papacy, and, as editor of the *Univers*, soon signalized himself as an aggressive and uncompromising champion of the church. In 1842 he accompanied marshal Bugeaud to Africa as his secretary, and on his return was made chief secretary to the ministry of the interior. He again edited the *Univers* in 1848; but his polemical disquisitions brought upon him the censure of the archbishop of Paris; and in 1853 the clergy of the diocese of Orleans were expressly forbidden by their bishop to read the *Univers*, which, after the usual three warnings, was suppressed by the French government in 1861. It was afterward replaced by the *Monde*, in which Veuillot discussed religious matters in a more temperate spirit. In 1862, he published a pamphlet, under the title of *Parfum de Rome*, which was principally devoted to heaping coals of fire on the head of Cavour, and assailing the abbé Passaglia with the bitterest objections. He prays, for instance, that "his robe may become a robe of fire," and that Heaven "may refuse him a single tear to temper its burning." In 1867, the *Univers* was revived. Veuillot, besides polemical pieces, has written novels, hymns, and a collection of articles under the title of *Mélanges Religieux, Historiques, et Littéraires* (1857). One of the most brilliant of his productions is *Les Odeurs de Paris* (1866). In 1868, a collection of extracts from his writings was published by the abbé Charbonnell.

VEVAY (Ger. *Vies*), a small town of Switzerland, in the canton of Vaud, remarkable for the beauty of its situation, on the n. shore of the lake of Geneva, 11 m. e. of Lausanne. It stands at the mouth of the gorge of the Veveyse, where it opens upon the lake, and where the scenery of the banks is exceedingly beautiful. From the elevations about the town, the fine view to the e. commands the gorge of the Rhone, backed by the magnificent rampart of the Alps of Valais. In the church of St. Martin (date 1438), Ludlow, one of Charles I.'s judges, and Broughton, who read to him his sentence of death, are buried. The country in the vicinity, especially that between Vevay and Lausanne, is much occupied by vineyards and orchards, and the wines of the vicinity have some reputation. Pop. '70, 7,887.

VIADUCT, a structure for conveying a roadway across a valley or low level, being so called in distinction from an *aqueduct* (q.v.), which is an erection of the same description for the conveyance of water over a hollow. It is in every respect similar to an extended bridge. The great extension of railways within recent years has rendered the use of viaducts much more common than formerly. These are of every kind of construction—of wood, iron, stone, and brick work (see **BRIDGE**, **TETULAR BRIDGE**, **WOODEN BRIDGES**, etc.). A railway embankment is also a species of viaduct; but the term is limited to those structures which are more or less open, and rest upon piers. A very peculiar example is that over the Moine, near Nantes in France. The piers are all perforated by a pointed arch, which intersects the main cylindrical arches, and forms a groined roof, similar to that of a Gothic cathedral. This viaduct consists of 15 arches, and is 348 ft. in length, and is all built of fine granite.

VIA-MALA, a remarkable defile in the canton of Grisons, Switzerland, is a portion of the Hinterriethal (see **RHINE**) which lies between Thusis and Zillis. The sides of the cleft, which is about 2 m. in length, are immense walls of rock, almost parallel to each other, and so hard that the disintegrating influence of the elements appears not to have produced the slightest effect on them, each projection on one side corresponding to an indentation on the other, almost as perfectly as at the time they were separated. The walls have a maximum height of about 1600 ft., and at various parts of the defile are not more than ten yards apart at the top. Far beneath, the Hither Rhine, compressed till it appears to one above like a mere thread, rushes like an arrow through the gorge. The first part of this defile was long deemed quite inaccessible, and had received the name of the Lost Gulf (Fr. *Trou perdu*; Ger. *Verlorenes Loch*), but in the early part of this century, a magnificent road was constructed along the whole length of the defile, from 400 to 600 ft. above the river, by blasting and cutting a "notch" in the side of the rock. The road is necessarily steep and narrow, crosses from side to side of the defile by three bridges, and is protected now by a canopy of rock overhead, and again by a wooden roofing, from falling stones and trees. So narrow is the crevasse in some places, that fallen trunks and stones are often wedged in between its sides at a considerable distance above the ordinary water-level; and on the occasion of the great flood of 1834,

the river, which is generally 400 ft. below the second bridge, rose to within a few feet of it, and at the same time carried off the upper bridge.

VIANNA, a fortified city and seaport in the n. of Portugal, in the province of Minho, stands at the mouth of the Lima, 40 m. n. of Oporto. It is handsome and clean, with a tolerable harbor, which admits vessels of 150 tons burden; and it carries on considerable trade with Newfoundland in salt-fish. Pop. about 9,000.

VIARDOT, LOUIS, b. France, 1800; became director of Italian opera in 1839, and brought out Michelle Pauline Garcia, whom he married the next year. In connection with George Sand and Pierre Leveux he established the *Revue Indépendante* in 1841. Among his works, which include several translations from the Spanish, and the Russian of Turgeneff and Pushkin, are *Essai sur l'Histoire des Arabes et des Maures d'Espagne* (1832); and *Les Merveilles de la Peinture* (1868).

VIAREGGIO, a t. of central Italy, in the province of Lucca, close to the shore of the Mediterranean, 30 m. s. e. of Spezia. It is modern, stands in a delightful plain, and has wide straight streets. At the beginning of the present century it consisted of only a few huts; but its climate, which is healthy and delightful all the year round, and its fine situation, have induced many rich families to settle here, and it is yearly increasing in extent. It is much frequented for bathing in summer. The vicinity is productive in olives, grapes, etc. Pop. about 10,000.

VIATICUM (Lat. *viaticum*, money allowed for a journey), the word applied in the ancient as well as modern ecclesiastical terminology to the communion administered to dying persons, which, in the case of the great journey to eternity, is thus quaintly likened to the money-provision made for a journey upon earth. The special ministration of the eucharist to the dying is very ancient (see LORD'S SUPPER); it was the one exceptional case in which, during the times of rigorous canonical penance, the penitents were admitted to the communion before the completion of the appointed cycle of penance. By the modern practice of the Roman church, it is permitted to the sick, to whom the eucharist is administered in the form of the viaticum, to receive it, although not having fasted (as is required in all other cases) from the midnight previous. The viaticum may be given frequently during the same sickness, at intervals anciently of ten or seven days, but, by the modern practice, even daily, should it be earnestly desired by the sick person. The priest is ordered to bring the sacred elements from the church to the dying person at any hour, whether by day or by night, when he may be called on for this last service of religion.—Protestants reject the very idea of a *viaticum*, and regard the administration of the Lord's supper in that character as superstitious.

VIATKA, a government of the e. of European Russia, bounded on the e. by the governments of Perm and Orenburg, and on the s. by that of Kazan. Area, 59,000 sq. m., pop. '70, 2,406,024. The surface consists for the most part of marshes and sandy plains, varied here and there by hills. The soil, fertile only in the southern districts, is mostly a mixture of sand and clay. In the s., agriculture is effectively carried on, wheat, rye, barley, and oats being produced in abundance, as well as flax and hemp, which supply materials for the linen manufactures. The principal rivers are the Viatka and Kama (navigable throughout the whole year), and their affluents. Owing to the number of navigable streams, and to the well-regulated land communications, the traffic of the government is successfully carried on. Horses of a fine breed are reared, but the principal source of the wealth of Viatka is its timber. Iron-works, distilleries, tanneries, and glass and cotton factories are in operation.

VIATKA, a t. of Russia, capital of the government of the same name, on the river Viatka, 280 m. n. e. of Nijni-Novgorod. It was founded by the inhabitants of Novgorod, and was annexed to the Muscovite dukedom in 1489. The chief branches of industry are the preparation of skins and the manufacture of tallow and wax-candles. Corn is exported annually to the amount of 300,000 roubles (£46,875). Pop. '67, 19,885.

VIAZMA, a t. of Great Russia, in the government of Smolensk, and 100 m. e. n. e. of the town of that name, on the Viazma. It is first mentioned in 1239, and, after being owned successively by the Lithuanians and Poles, it finally became Russian in 1634. In 1812, after a bloody battle between the Russian and French armies, in which the former was victorious, Viazma was demolished, and there are now hardly any remains of the old town. It carries on an active trade in corn, flax, hemp-seed, tallow, etc., and is the entrepôt for goods exported to St. Petersburg and Riga. Viazma gingerbread is exported to all parts of the empire. Pop. '67, 9,457.

VIBI CES. This term is applied in medicine to patches on the skin, varying in tint from bright red to violet, which occur in certain diseased conditions of the blood, and especially in purpura. They are caused by minute hemorrhages of the capillaries of the true skin. The word is a Latin one, being the nominative plural of *vibex*, *-icis*, the mark of a stripe.

VIBORG, a ltn of Finland, Russia, having the gulf of Finland for its s. boundary; 16,611 sq. m.; pop. '72, 276,884. It contains a part of lake Ladoga and lake Saima. The soil is fertile; producing annually 48,000 bushels of buckwheat. Live stock is raised in large numbers. It contains a strong fortress at Frederickshamn, on the bay of Finland,

where the treaty of 1809 was concluded between Russia and Sweden, in which Finland with Lapland and the Åland islands was made over to Russia. Capital, Viborg.

VIBORG, the oldest city in North Jutland, and one of the oldest in Denmark, on a small lake, 25 m. w. of Randers. Its cathedral, originally founded in the 13th c., was rebuilt in 1736. Viborg, at which all of the great highways of the interior converge, is important as a military post. Pop. 72, 6,422, engaged in the manufacture of woollen fabrics, leather, and tobacco.

VIBRIOLIDE, a family of infusoria, having an elongated or worm-like form, of which the ear-cockle (q.v.) is an example. They derive their name from their darting and quivering motion. Some of them, as the ear-cockle, are found in living plants, others in corrupting organic matter, as the *cels* of paste and vinegar.

VIBURNUM, a genus of plants of the natural order *caprifoliaceæ*, having a 5-toothed calyx, a 5-lobed, wheel-shaped, bell-shaped, or tubular corolla, 5 stamens, 3 sessile stigmas, and a one-seeded berry. The species are shrubs with simple leaves, natives chiefly of the northern parts of the world. *Viburnum opulus* is the guelder rose (q.v.), or snowball tree, and *viburnum laurustinus* is the laurustinus (q.v.), both well-known ornamental shrubs. *Viburnum lantana*, sometimes called the WAYFARING TREE, is a native of the warmer temperate parts of Europe and Asia, not unfrequent in England, and often planted as an ornamental shrub. It is a large shrub or low tree, with large elliptic serrated leaves, downy, with star-like hairs on the under side. The young shoots are very downy. The flowers are small and white, in large dense cymes; the berries purplish black, mealy, and mucilaginous, with a peculiar sweetish taste, disagreeable to many, but relished by some. They are useful in diarrhoea and catarrh. Birdlime is made from the roots in the s. of Europe. The inner bark is very acrid, and was formerly used as a vesicant. The wood is white and hard, and is prized by turners. Tubes for tobacco-pipes are made of the young shoots.—Two North American species, *viburnum edule* and *viburnum caryococcum*, nearly allied to the guelder rose, produce berries of an agreeable acid taste, which are used like cranberries.

VICAR (Lat. *vicarius*, from *vicem*, i.e., *gerens*, acting in the place of another), the title given to the substitute, whether temporary or permanent, employed to act in the place of certain ecclesiastical officials, whether individuals or corporations; as of the pope, a bishop, a chapter, a parish priest, etc. Vicars take different names from these various considerations. Vicars of the pope are called "vicars-apostolic," and they are generally invested with episcopal authority, in some place where there is no canonical bishop. Vicars of a bishop are either "vicars-general," who have the full authority of the bishop all over his diocese, or "vicars-forane" (Lat. *foraneus*, from *foris*, abroad), whose authority is confined to a particular district, and generally otherwise limited. A vicar-capitular is the person elected by the chapter of a diocese, during the vacancy of the see, to hold the place of the bishop, and to exercise all the authority necessary for the government of the diocese. The vicar-capitular, however, is not competent to do any act of episcopal order, as ordination, confirmation, etc. His power is restricted in other ways which it would be out of place to detail here. Parochial vicars are either perpetual, as in parishes which were anciently held *in commendam* (q.v.), or which were held by religious corporations; or temporary, whose appointment may be recalled at pleasure, or after a fixed time. The name, in this sense, is sometimes given, especially in the Roman Catholic church, to the assistant-priest, or as he is called in England, the curate, in a parish. The functions of "vicars-apostolic" are described under the **LEAD IN PARTIBUS INFIDELIUM**.

VICE-ADMIRAL. See ADMIRAL and FLAG-OFFICER.

VICE-CHAMBERLAIN. See CHAMBERLAIN, LORD.

VICE-CHANCELLOR, a judge in equity, appointed by the crown under letters-patent to assist the lord chancellor of England. The title and functions are at least as old as the reign of Henry II.; but the office long fell into disuse, and was revived by statute 53 Geo. III. c. 24, appointing one vice-chancellor; act 5 Vict. c. 5, s. 19, afterward appointed two more, on the abolition of the equitable jurisdiction of the court of exchequer. The office is ancillary to that of the lord chancellor, for whom the vice-chancellor is empowered to act in his absence, besides being entitled to hold separate courts. The vice-chancellor and the master of the rolls are now part of the chancery division of the high court of justice, each sitting as a separate divisional court. The vice-chancellors hold their office *ad vitam aut culpam*, and are not bound, like the lord chancellor, to resign office with the ministry.

The vice-chancellor of a university is an officer who is empowered to discharge certain duties of the chancellor, chiefly those connected with granting degrees, in his absence.

VICE-CONSUL, a subordinate officer, to whom consular functions are delegated in some particular part of a district already under the supervision of a consul. A British vice-consul is selected by the consul under whom he is to act, and his name is transmitted for approval to the secretary of state for foreign affairs. If he is approved of, the consul is directed to furnish him with authority to act, and to impart to him instructions similar to what he himself has received from the foreign secretary. The vice-consul acts

under the general supervision of the consul, corresponding with him in ordinary cases, but in some special cases with the foreign office. A consul is not at liberty to dismiss a vice-consul acting within his district without the sanction of the foreign secretary; but if of opinion that sufficient grounds for the dismissal exist, his duty is to give information to the foreign secretary, suspending the vice-consul in the mean time, if the circumstances be urgent; and in all cases awaiting the decision of the foreign secretary before taking ulterior steps.

VICE-PRESIDENT, an officer of the U. S. government, whose official function consists in presiding over the senate, where he can vote only in case of a tie, and who succeeds to the presidency upon a vacancy in the latter office. He is elected with and in the same way as the president; and if there has been no election of a vice-president by the electors, a majority vote in the senate, if there be a quorum of two-thirds present, will elect him. In the absence of such a majority he is elected from the two candidates receiving the largest senatorial vote.

VICENNIAL PRESCRIPTION, in the law of Scotland, is the limitation which is put to certain actions after the lapse of 20 years, such as actions by heirs to reduce an erroneous retour.

VICENTE GIL. See GIL, VICENTE, *ante*.

VICENZA, a province in n.e. Italy, adjoining the Tyrol, drained by the Brenta and the Bacchiglione rivers; about 1000 sq. m.; pop. '72, 363,161. The surface is generally level, except in the n. where it is intersected by ridges from the Alps. There are large forests. The soil in the level districts is fertile. The chief productions are cattle, silk, and wool. Coal is found. There are extensive manufactures. Capital, Vicenza.

VICENZA, a handsome city of Venetia, beautifully situated at the confluence of the Bacchiglione and Retrone rivers, 42 m. w. of Venice by railway. The rivers are crossed by eight bridges, one of which, a bold, single arch, is attributed to Palladio, who was a native of the city, and to whose genius it is much indebted for its beauty. Vicenza is surrounded by a moat, and walls half in ruins, and contains many fine palaces and churches. The Piazza dei Signori, a remarkably fine square, contains a lofty and slender campanile, 270 ft. high, and only 23 ft. wide. The Palazzo della Regione is a handsome Gothic building, by Palladio. The Palazzo Prefettizio, by the same architect, is a rich and fanciful Corinthian edifice. The Duomo, built in 1467, is Gothic; the nave of it is 60 ft. wide; and in certain of the chapels are interesting pictures. The Teatro Olimpico, the scenery of which is fixed, and represents a species of piazza, with diverging streets of real elevation, but diminishing in size, is by Palladio. Vicenza contains a lyceum, a seminary, and a picture gallery; a library, numbering 60,000 vols., and a hospital, and many benevolent institutions. Manufactures of silk, linen, earthenware, paper, and velvet are carried on. The surrounding country, studded with mansion-houses, and rich in vineyards, is exceedingly beautiful. Pop. '72, 37,686.

Vicenza (anc. *Vicentia*, or more correctly, perhaps, according to inscriptions, *Vicetia*) is a very ancient city. An inscription records its existence in 136 B.C., and it continued to be a municipal town of some consideration, till it was laid waste by Attila, 452 A.D. It revived again under the Lombards, and became for a time, in the middle ages, an independent republic.

VICEROY (Lat. *vicer*, in place of, and Fr. *roi*, king), a title popularly given to any officer who is delegated by a sovereign to exercise regal authority in his name in a dependency, as the lord-lieutenant of Ireland—who, however, is never officially so styled. It was the proper official designation of the governors of Naples, Spain, and Peru, under the old Spanish monarchy. See KUEDIVE.

VICH, or **VIQUE**, a city of Spain in Catalonia, modern province of Gerona, on a hill-girt plain about 45 m. n. of Barcelona. Its cathedral, built about 1040, but repaired and modernized about the end of the 18th c., is bold and elegant in the interior, and the Gothic cloisters are of the most rich and elegant description. Corn, fruit, and a bad wine are the products of the vicinity; and the inhabitants are employed in weaving, and in the manufacture of hats and paper. Pop. 12,100. Vich, the Roman *Ausa*, was afterward called *Ausona* and *Vicus Ausonensis*, of the first part of which its present name is a corruption.

VICHY, a small t. of the interior of France, in the department of Allier, stands on the Allier, in a fine valley, surrounded by hills clad with vines and fruit trees, 35 m. s.s.e. of Moulins. Pop. '76, 6,154. Vichy is the most fashionable bathing resort in France. The springs which rise at the foot of the volcanic mountains of Auvergne (q.v.) are of the alkaline class, and the most efficacious of the kind that are known. They vary in temperature from 68° to 112° Fahr., and are used both for drinking and bathing. They are resorted to in cases of indigestion, chronic catarrh, gout, etc. See MINERAL WATERS.

The virtues of the *aque calide* of this place were known in Roman times, as is testified by the numerous remains of marble baths and coins of the times of Claudius and Nero that have been dug up; but their modern repute arose only in the present century.

VICIA. See VETCH and BEAN.

VICKSBURG, a city and port of Mississippi, U. S., on the Mississippi river, 408 m. n. of New Orleans, 44½ w. of Jackson, built on a collection of high bluffs. It is the chief town between Memphis and New Orleans, exporting at present as many as 200,000 bales of cotton per annum. It was strongly fortified in 1861, and provided with a large garrison. In Jan., 1862, it was attacked by the U. S. naval forces from Memphis and New Orleans, but without success. In April, 1863, a naval attack was combined with the land-forces under gen. Grant, who defeated gen. Pemberton near Jackson, cut off supplies and re-enforcements from the garrison, and with a close siege and continual assaults, compelled a surrender, July 4, 1863, with 30,000 prisoners of war, 200 cannon, and 70,000 stand of arms. Pop. '70, 12,443.

VICKSBURG (*ante*), co. seat of Warren co., on the e. bank of the Mississippi river, on the Vicksburg and Meridian, the Vicksburg, Shreveport and Pacific, the Mississippi Valley and Ship Island, and the Vicksburg and Nashville railroads; pop. '80, 11,814. It is built on high uneven ground, rising irregularly from the river. The streets are regularly laid out, but narrow. It contains a handsome court-house, daily and weekly newspapers. It is the center of a great cotton-growing region and has a large trade in other commodities. It is connected by steamer with St. Louis and New Orleans. The manufacturing interests of Vicksburg are being rapidly developed, and it is in all respects one of the most prosperous communities in the south. It contains car-works, machine-shops, a rolling mill, saw-mills, planing-mills, carriage-factories, boiler-works, etc. The first settlement at Vicksburg was made in 1836. It was incorporated in 1840.

VICKSBURG, SIEGE OF. In the early months of 1863, to capture Vicksburg, the last remaining fortress of the confederates on the Mississippi, and thus to re-open this great river, in its entire length, for all national purposes, was an enterprise scarcely less difficult than important. Hence the concentration, for many months, of naval and military forces to subdue this stronghold. The unsuccessful attempts to reduce the fortifications by bombardments from the iron-clads in the river, and to change the river channel, leaving the city far inland, compelled the conviction that Vicksburg could be captured only by land forces approaching from the rear. Supported by this change in public opinion, gen. Grant moved down the w. bank, and crossed the river at Bruinsburg, April 30. Following his own plan, he first advanced upon Jackson, where the confederate armies were concentrating under gen. Johnston. Quickly dispersing these gathering forces he destroyed all the centering railroads, and left the confederates no means of reorganization. Returning then to his original purpose, gen. Grant invested Vicksburg so closely that there was no escape, and cannonaded the fortifications and the town so fiercely and incessantly that endurance was impossible. The garrison and the people were driven to the last extreme of suffering, when this terrific day-and-night siege of six weeks was terminated by a complete surrender, on the same day that crowned the equally memorable and hard-fought three-days' battle of Gettysburg.

VICO, GIAMBATTISTA (or GIOVANNI BATTISTA), a jurist, philosopher, and critic, was born at Naples, 1668, spent the whole of his life in that city, and died there in 1744. He was the son of a small book-seller. He was educated by the Jesuits, and afterward studied for the bar. Weak health preventing him from following his profession, he became tutor in jurisprudence to a nephew of the bishop of Ischia; and after filling this position for nine years, he obtained the chair of rhetoric in the university of Naples. This office was poorly paid; but though much distinguished by persons of the highest position, Vico did not succeed in getting a better one until the accession of the Bourbons, 1735, when he was appointed historiographer to the king of Naples. As he married early, and had a large family, his life was passed in great poverty, and it was, moreover, embittered by family troubles, and by constant ill-health. The great work which has made his name illustrious, the *Scienza Nuova*, first appeared in 1725; but it was completely recast in a subsequent edition, published in 1730, with the effect of making it more imposing as a system, at the expense of a great loss of clearness. A third edition, in which the work was considerably enlarged, was published in 1745, shortly after the author's death. In the *Scienza Nuova*, Vico brought together, and attempted to fuse into a system, opinions which he had previously advanced in a somewhat numerous series of separate treatises. The work was long in arriving at its proper place in European literature, which must be in a great measure attributed to its obscure and enigmatical style. Much of the obscurity arises from the use of an uncouth terminology, which the author often leaves unexplained, and (in the case of the later and authoritative editions) from the rigorous application of the deductive method to subjects which do not always admit of it. The *Scienza Nuova* was virtually unknown out of Italy in 1822, when a German translation of it appeared at Leipsic. It was, a few years later, translated into French (with some curtailment) by M. Michelet (*Principes de la Philosophie de l'Histoire, traduits de la "Scienza Nuova" de G. B. Vico*; Paris, 1827); and the author has since that found his proper rank among the most profound, original, and ingenious of modern thinkers.

The *Scienza Nuova* (*De' Principj d'una Scienza Nuova d'interno alla Comune Natura della Nazione*) may be described as a *novum organum* of politico-historical knowledge. Observing, amid the infinite variety of thoughts and actions, of language and manners,

which the history of nations presents, a concurrence of the same characteristics, in the political changes which peoples the furthest removed from each other in time and place have passed through, an essential similarity of development, Vico proposed to himself the task of distinguishing amid social phenomena the regular from the accidental; of finding out the laws which govern the formation, the growth, and the decay of all societies; in fine, of tracing the outlines of the universal, the ideal history of society—the idea of which he himself believed to have existed from eternity in the mind of God. In doing this, he attempted, by means of historical criticism on the widest basis to illustrate the inter-dependence of all the sciences; to show that the progress of each of them is related to that of all the others, and the progress of all of them dependent upon, while also acting powerfully upon the general condition of society. And while holding that the actual state of every society is the result of a free development of the human faculties, he attempted to give a historical demonstration of the existence of a Divine Providence directing the career of nations, overruling the designs which men propose to themselves; operating, however, not by positive laws, or arbitrary interferences, but by means of methods and expedients which men resort to freely. It has been not inaptly said that the *Scienza Nuova* includes a system of social (as distinguished from natural) theology—a demonstration of God's government of the world, and of the laws in which that government consists. Vico, in these inquiries, accepted from Descartes the individual consciousness as one of the criteria of truth; but he also employed another—the collective consciousness, or the common sense of mankind—the accord of the race, as it may be gathered from history—in a word, authority.

It would be difficult to overrate the ingenuity and originality of many of the inquiries into which Vico was led by the attempt to delineate the ideal history of society; and he has rarely failed to put forward views, rational and probable, compared with those which were accepted among his contemporaries. With a truly admirable insight, he has not seldom hit upon the conclusions to which increased social knowledge and more scientific conceptions have conducted inquirers of later generations. Thus, in clearing the ground for the foundation of his system, he was led to precisely those views about Homer and the authorship of the Homeric poems which are popularly associated with the name of Wolf; and to anticipate the general view of the credibility of early Roman history which was elaborated by Niebuhr. —(See also COMTE, the germs of many of whose speculations may be found in Vico). The beginnings of religion, the origin of poetry and language, the commencement of society (which he ascribes to the influence of a common religious belief and worship), the foundation of the privileges of the heroic or aristocratic class, are among the earlier subjects of his speculation. He proceeds to trace the origin of jurisprudence, and to show how its development has been dependent upon social changes; and he afterward deduces from the history of ancient societies, and, in some degree from the history of the governments which sprung out of the ruins of the Roman empire, the laws which govern the progress, the conservation, and the decay of nations. A monarchy, with an equality of civil and political rights as between subjects, was his ideal of good government for advanced societies.

Though he ascribed to religion a paramount influence in forming and in conserving society, and though it was one of his principal objects to demonstrate the divine government of the world, Vico did not escape the suspicion of having written in a spirit of hostility to religion. It was alleged that he had written so obscurely, as he often did, through the fear of incurring ecclesiastical censures. Some critics of another school charged him, with at least equal plausibility, of having striven, both in his particular doctrines and in his consecration of the principle of authority, to satisfy the Roman Catholic church. The cavils made on either side, however, do not seem deserving of much attention; and it is pleasant to know that Vico, though not unconcerned about the accusations made against him, felt in his later years consoled for the many trials and disappointments of his life by the completion of a work, the greatness of which he knew better than any of his contemporaries. In 1818 the marquis deVillars published a collection of the whole of Vico's works. A second edition appeared in 1835.

VICTOR, CLAUDE PERRIN, Duke of Belluno, and Marshal of France, was born, Dec. 7, 1764 at La Marche, in the department of Vosges, and at the age of 17 enlisted as drummer in a regiment of artillery. He received his discharge after eight years of service as a common soldier; but re-enlisted in 1792, and having fortunately attracted the attention of Napoleon by his able conduct at the siege of Toulon, 1793, was promoted, through his influence, at the close of that year. In the Italian campaigns of 1796-97, and 1799-1800, he commanded the vanguard, and aided by the favor of Napoleon, who threw opportunities in his way, displayed great skill and extreme daring on numerous occasions. At Marengo he maintained such an obstinate resistance for eight hours to the overwhelming numbers of the enemy, that the expected re-enforcements had time to arrive, and convert the imminent victory of the Austrians into a crushing defeat. In 1806 he commanded, with distinction, a *corps d'armée* in the Prussian and Russian campaigns, and though captured in 1807 by Schill's partisans, he was exchanged (for Blücher) in time to win on the bloody field of Friedland, the baton of marshal of France, and the title of duke of Belluno. As governor of Berlin, he gained the esteem of the Prussians by his dignity and moderation; and in 1808 he was sent to command

the first corps d'armée in Spain. Here he gained several victories, notably over Blake at Espinosa, and Cuesta at Medellín; but was defeated by Wellington in the obstinate battle of Talavera (q.v.), and again by sir Thomas Graham at Barrosa (q.v.). After a fruitless blockade of Cadiz he was recalled to command the ninth corps d'armée in the Russian campaign of 1812; and though occasionally defeated in his many contests with the Russians his general conduct and success were worthy of his previous high reputation. When the allies, in overwhelming numbers, were closing round France, Victor appeared prominently in the fore-front of the defense, made a valiant stand at the passes of the Vosges, and retook St. Dizier and Brienne at the point of the bayonet; but his neglecting to occupy the bridge of Montereau was a fault which Napoleon could not pass over, and he was deposed in favor of Gérard (q.v.). Notwithstanding this disgrace he persisted in continuing with the army, and his zeal for his country suffered no diminution, as his energetic conduct at subsequent minor combats, and at the battle of Craonne, sufficiently proved. A severe wound which he received at this last battle brought his military career to a close; and had it chanced to be mortal, the character of Victor would have stood out in bold relief on the page of history as an able soldier, a faithful friend and follower, and a sterling patriot. But though not mortal, in a physical sense, it brought death to his hitherto spotless reputation; for the sickening ardor of his profession is of loyalty to the Bourbons, and his vile calumniations of the now fallen chief, to whom he wholly owed his rise, displayed the foulest ingratitude. Victor's servile attachment to Louis XVIII., however, gained him a peerage and other honors; but the readiness with which he accepted the presidency of the military commission appointed to try such of his old companions in arms as had deserted to Napoleon during the "hundred days" brought upon him merited obloquy. His subsequent career requires but brief notice. He was minister of war in 1821-23; second in command in the Peninsula in 1823; and was afterward accredited as ambassador to the court of Vienna. The Austrian court refused to receive him unless he laid aside his ducal title; and this question of etiquette attracted so much attention, and gave rise to so much vehement discussion that the good understanding of the two countries was for a time endangered. After this event, Victor took no part in public affairs, and died at Paris, Mar. 1, 1841.

VICTOR-AMADEUS, the name of three sovereigns of the house of Savoy.—**VICTOR-AMADEUS I.**, duke of Savoy, succeeded his father, Charles-Emanuel the great, in 1630, and carried on the war with France; but in 1631 he was forced to surrender Pignerol, La Perouse, Angrone, and Luzerne to France, in exchange for Montferrat and Alba. He paid great attention to the internal improvement of his dominions, and re-established the university of Turin on an extended scale; but the irresistible pressure exercised on him by Richelieu forced him into a war with the Spaniards in Italy; and after routing his opponents at Tornavento (1636) and Montebaldone (1637), he died at Vercelli, Oct. 7, 1637.—**VICTOR-AMADEUS II.**, grandson of the preceding, and one of the most able of princes, was born May 14, 1666, and succeeded his father, Charles-Emmanuel II., in June, 1675. Till 1680 the administration of government was in the hands of his mother, Marie-Françoise of Nemours, who, in spite of the pressure of France on one side and Austria on the other, succeeded in preserving a neutral attitude in the quarrels between her two powerful neighbors. In 1684 Victor-Amadeus married Anne-Marie of Orleans, the niece of Louis XIV.; but the overbearing insolence of the "Grand Monarque," who forced him to persecute the Waldenses (q.v.), and arrogantly ordered him to contribute an auxiliary force to the French army and give up the citadel of Turin, roused the ire of the high-spirited young duke, speedily put an end to the good understanding which would naturally have accompanied their intimate relationship, and drove him into a league with Austria and Spain against France. In revenge, a French army under Catinat assailed Victor-Amadeus's dominions, and though he was re-enforced by 4,000 Austrians under his relative, prince Eugene, the allies were completely routed at Staffarda (Aug., 1690), and the victorious Catinat had completed the reduction of Savoy and Nice before the winter of 1691. The duke, aided by considerable re-enforcements from Austria and Spain, gallantly maintained the contest; but a second and much more disastrous defeat at Marsaglia (Oct. 4, 1693), where he left 10,000 dead on the field, put almost the whole of Piedmont at the mercy of the French. The war, however, continued; the duke's obstinacy and almost romantic daring balancing Catinat's high military genius; till in the autumn of 1696 a treaty much more favorable to Savoy than to France detached the former from the grand alliance. When the quarrel respecting the Spanish succession (q.v.) broke out, Victor-Amadeus took part with France—an alliance cemented by the marriage of his second daughter, Louisa-Gabriele to Philip of Anjou, the new monarch of Spain, as well as by the previous (1697) marriage of his eldest daughter (the mother of Louis XV.) to Louis, duke of Burgundy, Louis XIV.'s grandson—and was appointed commander-in-chief of the combined armies of France and Spain; but though he was aided by the counsels of his old opponent Catinat, the Austrians, under his former ally, prince Eugene, defeated him at Chiari (Nov., 1701), and drove him behind the Oglio. Two years afterward, the successes of Vendôme in Italy and Villars in Germany, by bringing more prominently before his imagination the possibility of having the Bourbons for his neighbors on the e. as well as on the w., along with the tempting offers of Austria and Britain, induced him to abandon France and

join the alliance against her. In revenge for what they called the duke's treachery, the French under Vendôme overran and devastated Piedmont; but with the recall of their chief, fortune deserted the French, and they were totally routed by the duke and prince Eugene under the walls of Turin, Sept. 7, 1706. The duke, who had some years before retired from this contest, was rewarded by the treaty of Utrecht (1713) with the rest of Montferrat, Val-Sesia, Lomellino, and the island of Sicily, with the title of king; besides being acknowledged as heir to the Spanish throne in case of the failure of the Bourbon dynasty. In 1720 he was made to surrender Sicily to the emperor in exchange for Sardinia. The latter portion of Victor-Amadeus's long reign was wholly free from foreign strife; and his restless energy was employed in improving the system of administration, thoroughly assimilating the new continental acquisitions, in replenishing the treasury, which, in spite of the British subsidy, had been drained by the long contest with France, and in encouraging agriculture and industry, especially the cultivation of mulberry trees and tending of silk-worms. Reforms and improvements were effected in the university of Turin, and several colleges founded. On Sept. 2, 1730, the king abdicated; but attempting, in the following year, to resume the regal dignity and functions, he was arrested and imprisoned. He died at the château of Moncalieri, near Turin, Oct. 31, 1732.—VICTOR-AMADEUS III., grandson of the preceding, succeeded his father Charles-Emmanuel III. in 1773. His reign was full of misfortune and disaster, and was brought to a close by his death in 1796 after the compulsory cession of Savoy and Nice to the French republic.

VICTOR-EMMANUEL I. (Ital. *Vittore-Emanuele*), King of Sardinia, the second son of Victor-Amadeus III., was born July 24, 1759, and till his accession bore the title of duke of Aosta. He was one of the most determined adversaries of the French revolution; and on the outbreak of war in 1792, he was chosen to command the Sardinian army, repulsed the French at Gillette, and forced his way to the mouth of the Var, but was ultimately compelled to seek shelter among the Alps. He opposed himself strongly to the conclusion of peace with France in 1796; and from this time lived in southern Italy, and afterward at Cagliari, whence he did not return to Turin till 1814. He had assumed the royal title on his elder brother's abdication in 1802; and the treaty of Paris restored to him Piedmont, Nice, and the half of Savoy in 1814; the treaty of 1815 added the remainder of Savoy, while the congress of Vienna presented him with the duchy of Genoa—so that the little kingdom had profited territorially by its troubles. But the loyal delight of the Savoyards and Piedmontese at the return of their legitimate ruler was speedily quenched by the first acts of his administration. The French institutions to which they had been long enough accustomed to feel their immense superiority over the system they had supplanted, were abolished, and the old absolutism gradually restored. This change, which was no doubt to a certain extent effected by way of destroying all trace of French domination, by depriving the people of various important privileges and amenities, restoring old and hated abuses, and increasing taxation, excited wide discontent, which was heightened by the odious religious persecutions of the Vaudois and the Jews; secret societies were formed, and on Mar. 10, 1821, a revolution broke out. The army proclaimed the constitution promulgated by the Spanish Cortes in 1812; and the king, rather than take the oath to it, resigned in favor of his brother, Charles Felix, Mar. 23, 1821. He died at Moncalieri, near Turin, Jan. 10, 1824.

VICTOR-EMMANUEL II., the first king of a united Italy, was the son of Charles-Albert (q.v.) of Sardinia, and was born Mar. 14, 1820. He was a pupil of the Jesuits, but under his father's superintendence received an excellent education; and, being heir to the throne, he commanded, in accordance with an old custom of his house, the brigade of Savoy in the campaign of 1848-1849, and displayed great gallantry at Goito and Novara. On the evening of the latter battle, his father, seeing the hopelessness of the struggle, and unwilling to bow to the onerous conditions offered by Radetsky, abdicated in favor of Victor Emmanuel, who, being the husband of the archduchess Adelaide (the cousin of the Austrian emperor) and uncommitted to the views of the Italian ultra-democrats, might hope to obtain more favorable terms from the victor. Victor-Emmanuel thus ascended the throne of Sardinia, Mar. 23, 1849, and restrained effectually, for a time, the enthusiasm of the more ardent among the national party, though, on the other hand, he maintained, with the utmost fidelity, the provisions of the liberal constitution granted by his father. He made a happy choice of ministers in such men as Cavour, D'Azeglio, etc., whose policy it was to increase the strength and importance of the country by improved administration, rigid economy in the finances, care of the army, and encouragement to trade by the conclusion of commercial treaties with foreign nations. They saw too clearly that, despite the intense and almost unanimous desire for unity throughout Italy, a contest single-handed with Austria was utterly hopeless, and preferred, till a more convenient season, to seem to renounce all idea of any such project. The property of the state was sold, and various measures calculated to greatly diminish the privileges, and restrict within moderate limits the inordinate influence of the clergy, adopted—changes which brought upon the king the thunders of the Vatican; but Victor-Emmanuel, nothing daunted, protested by a vigorous "memorandum," and more obstinately asserted and maintained his independence of the papacy. The revolt at Genoa was sterily suppressed; but the king and his ministers were, in secret, by no means displeased to see that the feeling of nation-

ality was still vigorous; for, following the traditional policy of the house of Savoy, he was only biding his time to "descend with the valley of the Po," and swallow "another leaf of the artichoke." With the view of improving his position in Europe, and gaining a place at its council-board, he sent an army of 17,000 men, under La Marmora, to take part in the Crimean war on the side of Turkey; and visited (1855) in person the courts of Paris and London, being received by French and English with great enthusiasm. After the peace of Paris (1856) he entered into a closer alliance with France, gave his elder daughter Clotilde in marriage (Jan. 30, 1859) to prince Napoleon, and, backed by the French arms, provoked a war with Austria. The campaign was brief but decisive—the Austrians were routed in every battle, and the Italians were bailing with exultation the near approach to fulfillment of their long-cherished dreams of unity, when the suddenly concluded peace between France and Austria at Villa-Franca dashed their hopes to the ground. The Milanese (minus the fortresses of Mantua and Peschiera) only was to the Sardinian monarchy, and for this the king ceded Nice and Savoy (the cradle of his race) to France as the price of its alliance. But the people of central Italy refused indignantly the offer of prince Napoleon as their sovereign; and Tuscany, Modena, Parma, and the Romagna, renouncing their allegiance to their respective sovereigns, voted for annexation to Sardinia, and were formally adopted by Victor-Emmanuel, as his subjects. This was a greater advance toward the unification of Italy than the French emperor wished, and accordingly, Victor-Emmanuel, who was still dependent on his ally for safety, though secretly favorable to Garibaldi's expedition to Sicily, disavowed all knowledge of this project, and after the island was conquered without a blow being struck by a single Sardinian soldier, forbade the "Italian liberator" to pass over to the continent; yet he subsequently, with the consent of Napoleon III., sent an army to aid Garibaldi in conquering Naples, and formally accepted the sovereignty of the Two Sicilies. But in 1862 Garibaldi, thinking that the conquest of Rome in the same way would be equally acceptable to his sovereign, returned to Sicily, raised an army of volunteers, and was rapidly advancing on the ancient capital, when Victor-Emmanuel, forced by France, put an end to the expedition by capturing Garibaldi and his army at Aspromonte. Though proclaimed by the senate and house of deputies *king of Italy* in Feb. 1861, Victor-Emmanuel prudently postponed all attempts to annex Rome and Venice; and directed his attention to the internal affairs of his kingdom, which was much distracted by the intrigues of the sovereigns whom he had supplanted. At length, in the quarrel between Prussia and Austria for supremacy in Germany, appeared his opportunity; and an offensive and defensive alliance with Prussia was followed by an Italian invasion of Venetia (June, 1866). The Italians were defeated in the bloody battle of Custoza; but the disasters which befell Austria in her simultaneous contest with Prussia, forced the Austrian empire ultimately to surrender Venetia. In Aug., 1870, after the outbreak of the war between France and Germany, the last detachment of the French garrison which had occupied Rome since 1849 was withdrawn; the imperial city, finally united to the kingdom, became the capital of Italy and the seat of Victor-Emmanuel's court. The last years of Victor-Emmanuel's life were uneventful. He died after a short illness, Jan. 9, 1878, and was succeeded by his son Humbert.

VICTORIA, although one of the youngest, and, in point of area, the smallest of the colonies of the Australasian group, is already the most important. In extent of commerce, indeed, it takes precedence of all other colonies—India alone excepted. The extreme modernness, so to say, of the Australian colonial picture is one of its most striking features, for it belongs emphatically to the present generation. Men who are still in middle life may recollect when the Port Phillip settlement—the name first given to Victoria—had no existence; and those are not yet very old who may remember when even the geographical outline of Australia was incomplete, and when the great harbor of Port Phillip, now the busy scene of the world's commerce, was undiscovered and unheard of.

Geographical Position and Extent.—Victoria comprises the s.e. corner of Australia, at that part where its territory projects furthest into cool southern latitudes. Wilson's promontory, to the s.e., the most southerly headland, just passes the 39° of s. lat.; while the most northern point, which is at the opposite or n.w. extreme, is in s. lat. 34°. The long. comprises 9°—between 141° and 156° e. of Greenwich. To the w. is the colony of South Australia, separated by the 141° of e. long.; to the n. is New South Wales, separated by the line of the Murray river eastward from 141° e. long. to its source, and thence by a straight line s.e. to cape Howe; and from cape Howe to South Australia, again, the colony is bounded on the s. by Bass's strait. The extreme length is e. and w., and is about 480 m., by an extreme width, n. and s., of 250 miles. But a remarkable indentation of both the n. and s. boundary opposite each other, about the middle of the colony, reduces the breadth between the head of the Port Phillip inlet and the Murray to only 120 miles. The superficial area is 56,446,720 acres, or 88,198 sq. miles.

Physical Aspect.—Although Victoria may be called mountainous, as compared with the general flatness of Australia, it has much of the quiet and peculiar scenery characteristic of that division of the world. Vast naked plains are deviously traversed by broad and deep river-channels, which are mostly, however, mere chains of ponds, if not altogether dry, excepting in winter and spring, or after heavy showers. Overspread, in

cool and moist seasons, with brilliant verdure, the drought and heat of summer quickly convert the grass into a natural hay, which, in the scarcity of sustenance from its ceasing to grow in that condition, is eaten off to the very roots by the sheep and cattle, leaving the surface a bare and blackened mass. The "open forest" is another and very pleasing variety of scenery characteristic of Australia, and largely prevalent in Victoria. It distinguishes the gently undulating country of the better soils, whose surface is overspread by large trees, chiefly of the red gum (*eucalyptus*) and silver wattle (*acacia*). The trees being widely apart and of spare foliage, and the surface free from underwood, there is commonly a good growth of grass, the whole presenting a charming and park-like aspect, although felt to be somewhat tame and monotonous, especially under the great defect of most Australian landscapes, the general want of water. Mountain and forest prevail most in the e. division, where the Australian Alps of Gipps's land, the loftiest of Australian chains, culminate in peaks ranging from 1000 to 7,000 ft. above the sea. The w. district, on the other hand, is chiefly remarkable for its numerous isolated hills of volcanic origin, some of them with craters still perfect, which probably have not, in a geological sense, been very long at rest. To this extensive volcanic system Victoria owes the large proportion of its good arable land, as compared with the light sand-stone and granite soils that prevail elsewhere in Australia. The chief rivers, besides the Murray and its branches (elsewhere treated of), are the Snowy river, the Tamba, the Mitchell, the Macallister, and the La Trobe—all of Gipps's land; the Yarra-Yarra, the Goulburn, the Loddon, the Wimmera, the Avoca, the Wannon, the Ovens, the Hopkins, and the Glenelg, of which rivers, however, several are not perennial streams. The Australian fauna is very remarkable; notably the kangaroo or pouched family, and the emu or great wingless bird. There are besides the *chilina* and *platypus*, of quite a different family, and even more singular in structure, especially the last, as indicated by its other name of *ornithorhynchus paradoxus*. The dingo, or native dog, is remarkable as a non-marsupial exception, on which account it has been regarded as an introduction by human agency. But several years ago prof. McCoy of Melbourne met with its fossil remains associated with those of extinct animals, and in deposits that, although recent, geologically speaking, are in other respects so remote as to establish this animal's indigenous claim.

Climate.—This is on the whole healthful and agreeable, but subject to frequent and sudden change in condition and temperature. The average temperature of the year is between 57° and 59°, or about 9° above that of London, and 11° above that of Edinburgh. The common summer-heat is from 65° to 80°, with an occasional advance to 90° and even to from 100 to 108°, during hot winds and a dry season. The winter range is mostly from 45° to 60°. Ice occurs in the midwinter of July, but it rarely, except on elevated ground, survives the noontday sun. Every few years an unusually severe season will cover the higher levels, and even the country generally, with snow, to recall to the colonists the familiar scenes of ancestral homes. The cold of winter is keenly felt, and household fires are not uncommonly indulged in for even six months of the year, especially in the morning and evening.

Civil and Political Divisions.—Victoria is divided into four districts and 37 counties, the principal counties being Bourke, Talbot, and Grant. Prior to 1848 there were but three counties, the still existing Bourke, Grant, and Normanby, laid out in 1837, along with the sites of several chief towns, when the infant settlement, then but two years old, was officially taken charge of by the New South Wales government, within whose jurisdiction the territory was then comprised. One chief object of the counties was to distinguish by certain special regulations the more accessible and valuable of the colonial lands, leaving the remainder (the districts) to pastoral or squatting uses. But the subsequent discovery of the gold-fields in 1851 interfered with this arrangement, as the new condition created towns and markets indiscriminately in county and district. Squatting is still an important colonial vocation, second only to gold-mining, and still pursued over most of the colonial area. The electoral districts, in general, coincide (but not always) with county and municipal divisions. This is the case for the assembly, but for the council or upper house there is a special division of the colony into six great districts. A law of the colony specially facilitates townships to become municipalities; and as early as 1831 there were 61 such towns, all of them with their respective mayors and corporations.

History.—The distinction of first settling Victoria is due to the Messrs. Henty of Launceston, Tasmania, who occupied the s.w. part at Portland bay with some flocks of sheep in 1834. But the settlement that mainly influenced the future was that of the following year upon the shores of Port Philip. This enterprise also was from Launceston, first in May and June by a small party under Batman, which occupied Indented Head, on the w. side, 15 m. inside the harbor; and again in August following by another party sent forth by Fawkner, he himself having been detained a short while longer by sickness. This last party passed on to the head of Port Philip, ascended the Yarra, and settled upon the site of the present capital, Melbourne. The story of the subsequent progress is marvelous even in an age of marvels as to colonies. When the gold mines were discovered, the settlement, after 16 years' existence, had a colonial population of 80,000, of whom nearly one-third were in the capital. Thenceforth for several years the advance has scarcely been paralleled. The imports, exports, and the public revenue

increased tenfold. In 1856 Melbourne had become a city of great wealth and commerce, containing 100,000 inhabitants, while the colony comprised above 400,000. Although the race has since been at a more leisurely speed, Melbourne has continued to advance, and in 1877 the pop. had increased to 210,000. See *MELBOURNE*. Some interior towns, besides, are rising to importance, in particular Ballarat. Geelong, with 16,000 of population, finely situated on the western arm of Port Philip, was long second only to Melbourne, but is now surpassed by Ballarat (with 48,000) and Sandhurst (with 27,000), the two principal gold-field towns of Victoria. The pop. of Victoria in '71 was 731,528, of whom 330,478 were females; in '77, the pop. was 849,031.

Victoria, while a part of New South Wales, was termed the Southern or Port Philip district of that colony. As early as 1840 an agitation for separation, and a government independent of that of New South Wales, began, and was ended successfully in 1851, when the new colony received the name it now bears. The title of lieutenant-governor was then given to the queen's representative in this colony as well as in others adjacent, the governor-general being in New South Wales. But the rising importance of Victoria led to this distinction being discontinued some years afterward. This importance indeed expedited, to these colonies, their concession of self-government, which was inaugurated in the years 1854-56, with very lively demonstrations on the part of the colonists, who have since shown no want of interest or earnestness in the charge of their own affairs. During this last brief term, although the progress, in point of population, owing to diminished immigration, has been unimportant, there has been a very marked advance in the improvement of the colony generally, and of the arts and industries and amenities of social and commercial life. At the great international exhibition of 1862, Victoria stood at the head of the entire colonial department; and in less than twenty years this enterprising colony had undertaken to hold (1880) an international exhibition on a large scale in its own capital.

Population, Colonists.—The population of Victoria, in common with that of the other members of the group, is in the main English, in the wider sense of the word. The whole foreign element, including Germans and Chinese, does not exceed one-tenth. Of that proportion, the Chinese, whose sudden irruption into the colony, above 20 years ago, was at once one of the many novelties, as well as one of the doubtful benefits resulting from the world-wide fame of the gold-fields, now number 18,000. The Germans are the only other foreign element of any noticeable strength. They began to arrive in 1849, Australia having become favorably known to them by a considerable preceding emigration to Adelaide. They have proved, on the whole, an advantageous immigration, for although slow to adapt traditional usages to their new circumstances, they have set a commendable, and often a much-needed example of frugality, industry, and sobriety. The various divisions of the United Kingdom contribute somewhat ratably their quota to the colonial population. The census of 1871 gave the numbers in connection with the various denominations as follows: Church of England, 257,835; Presbyterians, 112,982; Methodists, 18,191; Independents, 16,311; Roman Catholics, 170,620; Lutherans, 3,540; Baptists, 10,559; Jews, 3,571. There are in the colony 1232 churches and chapels, besides 325 school-houses, and 577 other buildings, also used for public worship.

Natives.—By the census of 1871, the aborigines were found to number 1333, consisting of 990 males and 343 females. The number when the settlement began is usually stated to have been 6,000, although probably much larger, seeing that Tasmania, only one-fourth of the extent, and with a climateless genial to savage life, is supposed to have contained 5,000. But that is a point about which we can now only conjecture. The native is fast dying out from the colonized area. The progress of colonization has been utter destruction to his prospects. Philanthropic and Christian efforts on his behalf have not been absolutely barren. Mission stations in Gipps's Land, conducted by the Church of England and the Presbyterian church, have diffused the influences of civilization and religion to a considerable proportion of the survivors. These missions are under the immediate supervision of Moravians, and aim a little at the culture and preservation of the race, not without some evidences of success.

Commerce.—The two staple articles of export from the colony are wool and gold. The exportation of the former in the year 1875 was valued at £6,413,599; of the latter, at £3,690,695—in both cases a decrease as compared with the previous year. After the gold discoveries in 1851, there came an extraordinary commercial development. For that year, the imports had been £1,056,437, and the exports £1,422,909. In 1854 the amounts were respectively £17,659,051 and £11,775,204. But this sudden extension—at least as regarded imports—was not maintained, because it was due, in part, to a temporary extravagance, and partly because the colony has since then been successfully organizing its industry, so as to produce fully as cheaply and as well many articles that were at first imported. For 1876 the imports were £15,705,353; the exports, £14,196,487. In 1875 the shipping entries amounted to 1,693,885 tons—namely, inward, 840,386; outward, 833,499. The gold production of Victoria has gradually diminished from £12,000,000, to which it rose in 1856, to a little less than £3,200,000 in the year 1877. This diminution is partly made up to the world by the greatly increased gold-mining of late in New Zealand and New South Wales. The yearly production of all these colonies is now about £10,000,000, distributed thus: Victoria, 5; New South Wales, 2; Queens-

land, 1; New Zealand, 24. The greater part of this gold is usually sent direct to Britain, but the proportion is very irregular, depending on the state of the exchange with India. Thus while in 1873, £9,444,495 was received in England, in 1876 it was only £4,956,777, and the following year £6,655,438. The exportation of articles, the produce of this country, to Victoria amounted for 1877 to the value of £6,724,495; and the exports from Victoria to Great Britain were £8,584,299. The coal produce in 1877 in the colony was 8,971 tons, valued at £13,505.

The chief colonial vocations are squatting or pastoral pursuits, agriculture, and latterly, gold-mining. The first-mentioned was the earliest that rose to importance; but the last has rapidly outrivalled every other. Agriculture, at first dwarfed by the success and influence of squatting, and for a time impeded afresh by the social upturning during the first years of gold-mining, is now, however, rapidly extending, and is improving, socially as well as physically, the aspect of the country.

Squatting.—This colonial term has long since passed from its originally semi-savage and outcast associations, to represent in Australia a rural aristocracy. The squatter, using the country just as he found it, placed upon it his live stock, which lived and thrived on the natural herbage. This ready adaptation of the surface, with comparatively little of preliminary outlay, is the chief cause of Australia's rapid progress. At first, the pastoral "stations," or "runs," as they were then very appropriately called, were uninclosed areas, parceled out to a small number with a very bountiful hand, and at a nominal rent or occupation license-fee. Now, however, these areas have been much subdivided, and much has been done in inclosing the runs with stout fencing. By a late official return, there were in Victoria 1156 different stations, comprising an area of 31,875,468 acres, and contributing to the revenue a yearly rental of £225,113, 17s. 7d. The rate is from 4d. up to 8d. per acre, according to a valuation of pastoral capability. In 1878, there were in the colony 203,150 horses, 1,174,176 head of cattle, 10,114,267 sheep, and 183,391 pigs.

Agriculture.—Comparatively little was accomplished in this branch for 25 years, until 1860, when the government began to increase the facilities for acquiring and cultivating the public lands. In 1861 there were but 180,000 acres under the plow; in 1878, the extent of land under tillage was 1,420,502 acres. Comparing the returns of 1877-78 with those of the previous year, it appears that 2,391 new holdings had been taken, 255,569 acres of land purchased, and 189,397 additional acres brought under tillage. In the latter year 97,376 hands were employed on farms, 5,488 on stations. The dry climate of Southern Australia seems favorable to the quality of wheat; and the Victorian samples at the great exhibition of 1862 ranked among the very best. The wine-produce for 1876 was 755,090 gallons. Vine-culture rapidly extends, and wine-making is now general.

Manufactures.—The manufacturing industry of the colony is extending, and presumably in its interest a heavy protective tariff is maintained. In 1878 there were in Victoria 1763 manufacturing establishments, employing 27,618 hands. A branch of the royal mint was opened in 1872. Meat-preserving is carried on on a large scale; very large paper-mills have lately been built near Geelong.

Gold-Mining.—This may now be termed one of the skilled labors of the colony; but it is not by any means, on an average, among the most remunerative. Of the two great branches of mining—viz. (1), the crushing of the auriferous rock for the washing out of the gold, and (2) the washing from the débris or "drifts" which nature has already pounded down—the latter, as a simpler process, was at first the most general, but lately the other has been increasingly followed.

Railways.—The system is more extensive and complete than in any of the other southern colonies. At the end of 1877 there were 931 m. of railway open for traffic, and 32 m. in construction.

Finances.—The public revenue is derived mainly from three different sources—customs dues, land sales and rents, and public works. The total revenue of Victoria for the year 1870-71 amounted to £3,261,883. The chief items were—customs, £1,318,974; land sales, £367,565; public works (chiefly railway receipts), £643,451. The revenue for the year ending June 30, 1878, was £4,855,666. The income is generally ample for all expenses. The outstanding public debt amounted in 1878 to above £17,000; being at the rate of £20, 0s. 9d. per head of population. About $\frac{2}{3}$ of this amount represents the cost of the railway system now completed, and traversing the colony from Port Phillip to the river Murray. The remainder is the cost of water-supply to Melbourne and other parts of the colony, and of aids to Melbourne and Geelong for town improvements. This debt exists in the form of debentures, nearly all bearing interest at 6 per cent, and due at various terms up to 1891. These debentures are nearly all, excepting about one million, held in this country, and are well known in the London market, the chief stock being "the railway loan" of £7,000,000.

Taxation, according to the revenue accounts, amounts to a little over £5 per head. Deducting, however, the revenue from railways and from the sales of land, the amount per head is reduced by one-half, bringing it to about the same as in this country, although more equally distributed, owing to the greater equality of condition among the colonists, and more equal consumption of articles subject to customs dues. The customs revenue is derived mainly from strong drinks and tobacco. There are also moderate duties on

sugar, tea, and coffee, and various other articles. Municipal and road-district taxation are additional.

Political Institutions.—The self-government conceded to Victoria and the adjacent colonies gives them a responsible system similar to our own. The governor represents the sovereign, who appoints him; and he governs by ministries, who are of the crown's, that is, of the governor's nomination, but who must possess the confidence of parliament. There are two houses of legislation, both in Victoria being elective—the council or upper house by a high and special qualification; the assembly by manhood suffrage, without any qualification for members. Elections are by secret ballot. The term of the governorship is usually seven years. The present salary of the office in Victoria is £10,000 a year; and in the expensive times more immediately succeeding the gold discoveries, it was £15,000. Judged by the criterion of salary, the Victorian appointment is the most important of the colonial list, excepting the governor-generalship of Canada (which is of the same value), and the governor-generalship of India. The salary is paid wholly by the colony; but by a recent imperial act, the home government allows moderate pensions to retired governors, according to the term of service—a measure that had been called for in face of occasional reverses of fortune to the later life of persons who had previously represented royal splendor.

Religion.—The divergence of our self-governed colonies from home example is perhaps most striking in two very important subjects—religion and education. In religion, as in politics, the tendencies are toward a complete equality, and therefore opposed to the privileges involved in church establishments. In this respect, change of scene, and equality and independence of condition, sensibly weaken the strength of tradition and usage as exhibited in the senior country. All religious bodies, therefore, stand alike before the civil power, none having any coercive jurisdiction except such as its own members voluntarily impose upon themselves, either by their own rules, or by a special act solicited from the colonial legislature. In Victoria, until lately, there was a yearly donation of £50,000 from the public revenue to the support of religion. It was distributed ratably among the sects, Unitarians and Jews included, and was "scheduled"—i.e., not subject to yearly vote—under the constitution act. This system, introduced into Australia as a substitution for the preceding church of England supremacy, terminated in 1875. Lately, the public feeling had tended to a disapproval of the system of indiscriminate support to religion, and some of the smaller bodies had altogether rejected it. The state aid was therefore abolished in some of the colonies. In Victoria, the assembly had repeatedly passed an abolition act, which, however, the council negatived. Ultimately, a few years ago, a bill passed both houses, whereby the grant in aid to religion wholly ceased in 1875.

Education.—The energy displayed on this subject by the popular administrations of our self-governed colonies, and the tenacious persistence with which they encounter the problem of the education of the whole people, are among the best results presented to us by these young offshoots. Under the preliminary "imperial régime" of colonial public life, the comparatively neglected field as to education is taken up, and with creditable zeal, by the various clergy, who institute, of course, the denominational system. But essential difficulties stand in the way of the successful importation of a general education under this system. A national system, to compete with the previously established denominational, had been introduced into New South Wales and Victoria with the advent of the partially representative legislatures that for about twelve years preceded the present self-government. National and denominational, each conducted by a separate board of management, were alike aided by the state. The institution of a partially national system, and of a single board, was carried in the Victorian legislature in 1862. That system was in effect, that all state-assisted schools must be open to the children of all religious bodies, and that four hours daily of secular teaching be imparted to every pupil. This arrangement, on experiment, was unsuccessful. Schools still remained in connection with the several denominations; denominational school committees controlled the election of teachers, who were also permitted to impart religious instruction where desired. As a result, schools were unnecessarily multiplied in some localities, and the money of the state was wasted in their support. After various attempts to establish a system of state schools unconnected with any denomination—attempts which several of the religious bodies combined to defeat—the Victorian government at last succeeded in overcoming all difficulties, and a bill passed both houses of the legislature, which completely establishes a national, as opposed to a denominational system of education. The total number of public schools in Victoria is (1876) 1111, with an attendance of 104,375; 396 private schools, with 22,156 scholars; besides 5 grammar schools, various colleges, and the Melbourne university.

Remarks to Emigrants.—Intending emigrants should understand that Victoria is no longer a new and scantily peopled territory, with all the superabundant employment and means of subsistence that are readily found now-a-days on such a scene by help of the arts and implements of an advanced civilization. There are now in the colony the advantages of a settled society, having much of the amenities of home-life; but, on the other hand, the colonial vocations are tolerably filled up by the increasing population,

so that the unsuitable or the inexperienced have hardly any better chance out there than at home. It is owing to considerations of this kind that the system of free or assisted emigration—a system still maintained to a limited extent by the colony—has been latterly conducted upon very strict principles; the object being, that persons unsuitable to the colony may, as far as possible, be prevented from going there. The system of granting free passages has, on the whole, been recently discouraged by the legislature and government of Victoria, where the influx of the home poor is dreaded. Both free and assisted emigration is for the present wholly suspended. Laborers, mechanics, and artisans used to obtain assisted passages by what are known as passage warrants, issued to residents in the colony, on making the following payments to the colonial government: For each male under 15 years of age, £1; between 15 and 40, £8; above 40, £9; for each female under 15, £3; between 15 and 40, £4; above 40, £5. The warrants available for nine months after issue, had to be forwarded to the emigration agent of the Victorian government, to whom female domestic servants, desirous of emigrating to Victoria, should likewise apply; they are in great demand there, and have high wages. Steady-going working-men, agricultural and farm laborers in particular, are in request, and are sure to do well. Self-reliance, steadiness, and good conduct are essential requisites to success in all the colonies; with these, no working-man of the special classes referred to can fail to better his position, and add to the comforts and happiness of life. There is special encouragement to female emigration. As a general rule in Victoria at present, wages and remuneration generally are one-third or one-fourth higher than in this country; while the chief requirements of life are, one with another, at about the same price as they are here. House-rent is rather higher, while butchery-meat is cheaper, and other necessities about equal. The climate is, as a whole, highly enjoyable, with its bright skies and sunshine; but to working-men, six months of the year (from the middle of October to the middle of April) will be found somewhat oppressive for great physical toil—a consideration no doubt present to the working-classes of the colony in connection with their successful introduction of an eight hours' labor system. There are now more facilities than the colony formerly enjoyed for acquiring land at a reasonable price; and the climate has been found quite suitable for the cultivation of all the cereal crops of this country, as well as the grape and other fruits, the gift of a temperature more genial than that of England.

VICTORIA, a co. in s. Texas, having Lavaca bay for its s.e. boundary; drained by the Guadalupe river; 800 sq.m.; pop. '80, 6,290—5,462 of American birth, 2,407 colored. Co. seat, Victoria.

VICTORIA, a co. in n. New Brunswick, having the St. Johns river for its w. boundary, separating it from Maine; and Moose mountain in the s.w.; 3,490 sq.m.; pop. '71, 11,641. Capital, Grand Falls.

VICTORIA, a co. of e. Nova Scotia, on the island of Cape Breton, having the Atlantic ocean for its e. boundary; 1200 sq.m.; pop. '71, 11,346. Co. seat, Baddeck.

VICTORIA, a co. in n.w. Ontario, drained by large lakes; 1305 sq.m.; pop. '71, 30,200. Co. seat, Lindsay.

VICTORIA, a t. in Vancouver's island, capital of the province British Columbia, in the Dominion of Canada, stands at the s.e. extremity of the island. The entrance to the harbor is shoaly, narrow, and intricate, and at no state of the tide can admit vessels of over 17 ft. draught. Victoria was originally a trading establishment or fort of the Hudson Bay company, and has risen into importance only within recent years, when gold was first discovered in British Columbia. It is a free port; and considerable commerce is carried on. Pop. about 5,000. See VANCOUVER'S ISLAND.

VICTORIA, a sea-port of Brazil, capital of the province of Espiritu Santo, stands on a bay of that name, 270 m. n.e. of Rio de Janeiro. It has a good harbor, an active coasting-trade, and about 6,000 inhabitants.

VICTORIA, a genus of plants of the natural order *nymphaeaceæ*, resembling the common water-lily, but most nearly allied to the genus *enrydæ*, and distinguished from it particularly by the deciduous tips of the calyx, and the sterility of the innermost stamens. Only one species is yet known, *Victoria regia*. This is said to have been first observed by Hânke, about 1801, and afterward to have been seen by Bonpland, D'Orbigny, and others. It was first described in 1832 by Pöppig, who observed it in the river Amazon; and it has since been found by Schomburgk and others in many rivers of the n.e. of South America. Its leaves are orbicular, float upon the water, and attain a diameter of 5 to 6 ft.; have the margin turned up, and about two inches high; are of a purplish color on the under side, and there exhibit a sort of wicker-work of very prominent veins, furnished with prickles. The flowers rise among the leaves upon prickly stalks. They are more than a foot in diameter, white, internally rose-colored, and are very fragrant. The fruit is a capsule, almost globose, with a depression on the top, about half the size of a man's head, fleshy within, and divided into numerous cells, full of round farinaceous seeds, which are an agreeable article of food. The plant is therefore called *maïs del agua*, or water maize, in some parts of South America. To the cultivation of this plant, special hot-houses have been devoted in some places in Britain,

and elsewhere in Europe. It has been introduced into India from seeds produced in England.

VICTORIA I., Queen of the United Kingdom of Great Britain and Ireland, daughter and only child of Edward, duke of Kent, 4th son of George III., was born at Kensington palace, May 24, 1819. Her mother, Victoria Mary Louisa, was 4th daughter of Francis, duke of Saxe-Coburg Saalfeld, and sister of Leopold, late king of the Belgians. Her first husband, the prince of Leiningen, died in 1814; and on July 11, 1818, she married, at Kew, the duke of Kent. The duke died Jan. 23, 1820, leaving his widow in charge of an infant daughter only eight months old, who had been baptized with the names of Alexandrina Victoria. The duchess of Kent fulfilled the important duties which devolved upon her with more than maternal solicitude, and with admirable care and prudence. The infant princess, as she grew up, was taught to seek health by exercise and temperance, to acquire fearlessness even from her amusements, such as riding and sailing, and to practice a wise economy united to a discriminating charity. After a few years the duchess of Northumberland was associated with her mother in her nurture and education. The princess Victoria became accomplished in music, drawing, and the continental languages; and acquired a knowledge of some of the sciences, particularly botany. Her father having belonged to the whigs, her political education was naturally derived from the members of that party; and to viscount Melbourne (q.v.) belongs the credit of having thoroughly instructed her in the principles of the British constitution. She ascended the throne of the United Kingdom on the demise of her uncle, William IV. (q.v.), June 20, 1837; her uncle, the duke of Cumberland becoming king of Hanover in virtue of the law which excludes females from that throne. By this event, the connection which had lasted for 123 years between the crowns of England and Hanover was terminated. Victoria was proclaimed, June 21, 1837, and crowned at Westminster, June 28, 1838. She found on her accession viscount Melbourne at the head of the government; and during his premiership and with the cordial assent of her subjects, the young queen was married at St. James's palace (Feb. 10, 1840) to prince Albert (q.v.), prince of Saxe-Coburg and Gotha, and second son of the then reigning duke. Her majesty has had issue—four sons and five daughters: the princess royal, Victoria, b. Nov. 21, 1840, married Jan. 25, 1858, to Frederick William, now crown prince of Prussia and heir-apparent to the throne of Prussia; Albert Edward, prince of Wales, heir-apparent to the throne of the United Kingdom, b. Nov. 9, 1841, married Mar. 10, 1863, princess Alexandra of Denmark, eldest daughter of Christian IX., king of Denmark; princess Alice, b. April 25, 1843, married July 1, 1862, prince Frederick William of Hesse; prince Alfred, b. Aug. 6, 1844, created duke of Edinburgh, 1866, married Jan. 23, 1874, Marie, only daughter of the emperor of Russia; princess Helena, b. May 25, 1846, married in 1866 to prince Christian of Denmark; princess Louisa, b. Mar. 18, 1848, married in 1871 to the marquis of Lorne; prince Arthur, b. May 1, 1850, created duke of Connaught, 1874, married in 1879 princess Louise Marguerite of Prussia; prince Leopold, b. April 7, 1853; princess Beatrice, b. April 14, 1857.

It will be sufficient to mention here a few of the more memorable events of this eventful reign. The changes of administration may be traced in the articles GREAT BRITAIN, MELBOURNE, PEEL, RUSSELL, DERBY, ABERDEEN, PALMERSTON, GLADSTONE, DISRAELI. The legislative measures of greatest importance were the establishment (1840) of the penny-postage (see POST-OFFICE); the amendment of the poor-laws (q.v.) in Scotland (1845) and Ireland (1847); the abolition (1846) of the corn laws (q.v.), and (1849) of the navigation laws (q.v.); the Irish encumbered estates act (see TITLE, etc.); the transfer (1858) of the Indian possessions from the East India company to the crown (see INDIA); the admission (1858) of Jews into the house of commons; the reform act of 1867; the disestablishment of the Irish church (1869); the Irish land act (1870); the abolition of purchase in the army (1871); the elementary education act for England (1870), and the Scotch education act (1872). See NATIONAL EDUCATION. Other events which will signalize this period of British history were the formation of the free church (q.v.) of Scotland (1843); the discovery of the northwest passage (q.v.) by sir Robert McClure (1850); the exhibitions (q.v.) of 1851 and 1862; the discovery of gold in Australia (q.v.) and in British Columbia; the war (1854-56) with Russia (q.v.) in defense of Turkey (q.v.), in which the siege of Sevastopol was the chief item; the Indian mutiny in 1857 (see INDIA); the volunteer (q.v.) movement (1859); the establishment (1866) of telegraphic communication with America (see TELEGRAPH); the Abyssinian war, 1867 (see THEODORE); the formation of the dominion of Canada, 1867 (see CANADA); the Ashantee (q.v.) war (1873-74); the Afghan war (1878-79); and the Zulu war (1879). The same period has witnessed the most signal changes among surrounding nations; 1848 was a year of European revolutions, during which the only disturbance in Great Britain was an abortive chartist demonstration (see CHARTISM). The constitutional monarchy of France (q.v.) fell, and was succeeded by a republic, which soon gave place (1852) to the second empire under Louis Napoleon (q.v.), followed again by a republic in 1870. The great civil war in the United States of America (q.v.) has resulted in the extinction of slavery; the formation of the kingdom of Italy (q.v.) has been completed by the acquisition of Venetia and Rome; the unification of Germany, begun by the formation of the North German confederation, as the result of the war between Prussia and Austria in 1866, has been

consummated by the events of the Franco-Prussian war (1870-71); and the ever formidable "eastern question," raised again in 1876 by the insurrection in Herzegovina, led in 1877 to war between Russia and Turkey, and to sweeping changes in the Balkan peninsula (see TURKEY).

In 1876 "Empress of India" was added to the royal titles of queen Victoria. The premature death of the prince-consort (see ALBERT) on Dec. 14, 1861, caused the queen to seclude herself for several years from public life. Queen Victoria has published two volumes—*The Early Days of His Royal Highness, the Prince Consort*; and *Leaves from the Journal of our Life in the Highlands* (1869).

"In queen Victoria," according to Macaulay, "her subjects have found a wiser, gentler, happier Elizabeth." No former monarch has so thoroughly comprehended the great truth that the powers of the crown are held in trust for the people, and are the means, and not the end of government. This enlightened policy has entitled her to the glorious distinction of having been the most constitutional monarch England has ever seen. Not less important and beneficial has been the example set by her majesty and her late consort in the practice of every domestic virtue. Their stainless lives, their unobtrusive piety, and their careful education of the royal children have borne rich fruit in the stability of the throne, and have obtained for the royal family of England the respect and admiration of the civilized world. See Theodore Martin's *Life of the Prince Consort* (vols. i.-iv. 1873-79).

The progress made by the nation in the various elements of civilization, especially in that of material prosperity, has been unparalleled (see GREAT BRITAIN); and perhaps during no reign has a greater measure of political contentment been enjoyed.

VICTORIA BRIDGE, across the St. Lawrence at Montreal, on the Grand Trunk railway of Canada. This, the greatest tubular bridge in the world, was begun in May, 1854, and finished in Dec., 1859. The engineers were Robert Stephenson and Alexander M. Ross. The dimensions and other particulars are stated in the article TUBULAR BRIDGE.

VICTORIA CROSS. See CROSS, VICTORIA.

VICTORIA FALLS. See ZAMBESI, *ante*.

VICTORIA LAKE, called also ALEXANDRINA or KAYINGA LAKE, a brackish lagoon in the s.e. of South Australia, is separated from the sea only by a narrow belt. It receives the rivers Murray, Bremer, Angus, and Finniss, and communicates with the sea by a narrow passage that leads into Encounter bay. It is 30 m. long, and about 12 m. broad. A sandbar at the entrance to the lake impedes access for vessels from the sea; but the interior navigation is safe.

VICTORIA-N'YANZA. See N'YANZA.

VICUG NA, *Auchenia vicugna*, a species of the same genus with the llama and alpaca. It is a more beautiful animal than any of its congeners. In size, it is intermediate between the llama and the alpaca. Its neck is longer and more slender than theirs; its wool is also finer, short and curled. It is of a rich brown color, with patches of white across the shoulders and the inner side of the legs. The vicugna inhabits the most desolate parts of the Cordillera, at great elevations; and delights in a kind of grass, the yelhu (*stipa yelhu*), which abounds there in moist places; but it seldom ventures to the rocky summits, for which its tender feet are ill adapted. It is commonly found in small herds of from 6 to 15 females with one male. When the females are quietly grazing, the male stands apart and carefully keeps guard, giving notice of danger by a kind of whistling sound and a quick movement of foot. When the herd takes to flight, the male covers their retreat, often pausing to observe the motions of the enemy. If he is wounded or killed, the females gather round him, and will suffer themselves to be captured or killed rather than desert him. The vicugna is a very active animal, like the wild goat or the antelope. The Indians seldom kill it with fire-arms, but set up a circle of stakes, about a mile in circumference, into which the vicuñas are driven. A hybrid has been produced between the vicugna and the alpaca, which has a black and white fleece of long wool, resembling the richest silk.

VIDA, MARCO GIROLAMO, 1485-1566, b. Cremona, Italy; educated at Padua and Bologna, and became a canon of St. Mark at Mantua. In 1532 he was made bishop of Alba. VIDA was a learned Latinist and profound scholar. Of his poems, the best, a treatise *De Arte Poetica* (1527); *Christus*; and *Scæviæ Ludus*; have been translated into English, the last by Goldsmith.

VIDAURRI, SANTIAGO, about 1803-67; b. Mexico, began life as a lawyer, served in several wars, attained the rank of gen. and became governor of Nuevo Leon, 1853, arbitrarily annexing the state of Coahuila. He assisted in the operations against Santa Anna 1854-55, in the "war of reform" 1857-60, and against French intervention, 1862-64; became cabinet minister of Maximilian; was taken prisoner at the capture of the city of Mexico, and shot as a traitor.

VIDOCQ, FRANÇOIS-JULES, who acquired notoriety as a detective-officer of police at Paris, was born, July 23, 1775, at Arras, where his father was a baker. On the principle of set a thief to catch a thief his earlier life may be regarded as an almost invaluable apprenticeship to the profession in which he afterward became distinguished. As a boy,

he was employed in his father's shop, the till of which, it was found, he persistently robbed. To cure him of this evil habit, he was sent to the house of correction; but so little were his morals improved there, that he signaled his return to business by decamping with a sum of about £80. Of this money, a sharper relieved him at Ostend; and in order to keep himself in life, he engaged himself to sweep the cages of a traveling menagerie. From this menial service he was advanced to the post of tumbler and acrobat; and a further promotion was intended him to that of a supposed savage, whose performance involved the eating of raw flesh, and drinking greedily of blood. As he saw fit to decline the appointment, his further services were dispensed with; and shortly after, he returned to his father. Having entered the army, he attained the rank of corporal, and served with some credit in Belgium and elsewhere, till a wound obliged him to return home. For some years after, he seems to have lived as a scoundrel at large, occupying himself in swindling and disreputable love-affairs. In 1796 he turned up in Paris, and being detected in forgery, he was sentenced to pass eight years as a galley-slave. Before his term of durance had expired, he found means to escape, and became one of a band of highwaymen. As the story goes, his new associates on chancing to discover that he was an escaped galley-slave, saw fit to decline his further acquaintance. This refinement of squeamishness on the part of these gentlemen of the road, seems not in itself very probable; but on whatever ground of dislike, they desired to rid themselves of M. Vidocq, and summarily did so, exacting from him a solemn oath not to betray them. M. Vidocq took the oath very solemnly, and instantly proceeded to deliver the whole gang into the hands of the authorities. This pretty exploit seems to have suggested to him the *rôle* which he afterward developed with such consummate success. Hiding to Paris, he offered his services to the authorities there as a spy upon the criminal classes. His advances were at first coolly received; but gradually he made his way; and shortly his services became so important that official recognition was vouchsafed him. In 1812, a "Brigade de Sûreté" was organized, with Vidocq as chief. Consisting at first of only 4 men, by decrees it was enlarged till it came to include 28; and its efficiency was something marvelous. Suspicious, however, grew rife that Vidocq was himself the originator of many of the burglaries he showed himself so clever in hunting out, and even contrived to make a good thing of them. It does not appear that this charge was in any case clearly brought home to him; but M. Vidocq being plainly the sort of person in whom any suggested blackguardism is rather more likely than not, it had every inherent probability. Guilty or not, as he may have been, so strong was the popular feeling against him that, in 1825, it led to his being superseded. After his dismissal, he became a paper manufacturer; and in 1834, established a Trade Protection society, the object of which was to furnish confidential information as to parties whose credit might be dubious. In 1829 he published an autobiography, a *rédaetion* of which he put forth in 1844 (Eugène Sue's famous novel having just taken the public by storm), under the title of *Les Vrais Mystères de Paris*. Finally, he died in Belgium in the year 1850.

VIELÉ, EGBERT L., b. Waterford, N. Y., 1825; graduated at West Point, 1847; served in the Mexican war, 1847-48, and in the Indian wars, 1848-52. He became a civil engineer, 1852; state engineer of New Jersey, 1854-56, chief engineer of Central park, New York, 1856-57. In the war of the rebellion he entered the union army as capt. of engineers, 7th N. Y. militia, with the rank of brig. gen. of volunteers; engaged in the expeditions to Port Royal, Fort Pulaski and Norfolk; was military governor of Norfolk 1862-63, resigned in 1863, and resumed the practice of law in New York city. He is a contributor to the transactions of the American geological society, the historical society of New Jersey, and the New Jersey natural history society, and has published a *Hand Book of Active Service*, and numerous reports.

VIEN, JOSEPH MARIE, 1713-1809, b. France; studied art at the academy and after taking the grand prize in 1743 with his "Plague of the Israelites in the time of David," studied for six years at Rome. He became a member of the French academy in 1775, and director in 1781. His pictures are all of historical or mythical subjects, and he introduced a new style of painting. Among his best pictures are "Hector inciting Paris to arm for the Defense of Troy," "The Parting of Hector and Andromache," "Cupid and Psyche," and "The Resurrection of Lazarus."

VIENNA (Ger. *Wien*, Lat. *Vindobona*, afterward *Faciانا*), capital of the Austrian empire, stands on a plain at the foot of the last hills of the *Wiener Wahl*, which forms the eastern extremity of the Alps. East of it extends a vast plain, as far as the eye can see, away to the Carpathians, which are visible on a clear day in the distance. On the n., the hills approach within a half-a-dozen m. of the city, and extend uninterruptedly, to the w., to the Tyrolese Alps. An arm of the Danube (called a canal) passes along the n.e. side of the city, and separates it from the suburb of Leopoldstadt. Into this arm flows the foul and (when not swollen by rains) insignificant stream, called the *Wien*, from which the city takes its name. Vienna consists of the old city or inner town, called the *Stadt*, with narrow and irregular streets, and of a circle of suburbs, nine in number, completely surrounding it. Around the *Stadt*, and separating it from the suburbs, is a ring space upon which were formerly the fortifications, leveled in 1858. This space is now being rapidly covered with buildings, of which the principal form

part of the Ringstrasse, a handsome boulevard, in many places 70 yards wide. Besides the internal fortifications just mentioned, there is an external ring with rampart and fosse, which is still preserved as the boundary of the city imposts. These fortifications are called the *lines*, and at one time encircled both suburbs and city; the former are now, however, rapidly extending themselves outside. Unlike most other European cities, the old part of the city is the most fashionable. In the *Stadt* are the palaces of the emperor and of some of the principal nobility, many stately mansions, the public offices, the finest churches, most of the museums and public collections, the colleges, the exchange, and the best shops. Since the erection of the Ringstrasse and other buildings upon the site of the old glacis, however, very many of the aristocracy have gone there to live. The suburbs are laid out in wide streets, many of which, being unpaved, are extremely dusty in summer, and very muddy in winter. As a rule, the houses are let in "flats," almost the only exception to this being the palaces of the higher nobility, and in some cases even these consist only of the two lower stories of the building. Among the principal squares are the *Josephsplatz* and the *Burgthor* (the latter the court of the palace); the outer *Burgplatz*, which is laid out with grass and flowers, and in which stands the *Burgthor*; the *Neuer Markt, am Hof, and Frieung*. The latter three are in the heart of the city, contain many picturesque buildings, and are otherwise interesting, standing as they do in much the same relation to Vienna as the Grassmarket to Edinburgh. Vienna is the see of an archbishop; and the chief of its many churches is the cathedral of St. Stephens. This church is 354 ft. long, 229 ft. broad, and 80 ft. high, and has a very beautiful tower, 450 ft. high, erected in 1860-64, to replace the former structure, which was removed because of its unsafe condition. Its different parts have been built at many different periods, the choir having been commenced in 1359, while the nave dates a century later. The church of the Augustines is remarkable for its monument of the archduchess Christina of Saxe-Teschen, one of the most successful works of Canova. The most beautiful church in Vienna, and one of the most beautiful in the whole of Germany, is the *Votiv-Kirche*, built in commemoration of the emperor's escape from assassination in 1853. It is a Gothic church not completely finished till 1878, with two towers and spires, and covered with delicate and beautiful tracery and carving. The imperial royal palace is an ancient building, consisting of various parts, erected at different times. Adjoining the palace, or forming part of it, are the imperial library (410,000 vols.—12,000 printed before 1500—and 20,000 manuscripts), the treasury, the cabinet of coins and antiquities, etc. Among the other collections of interest are the belvedere, including the Ambras collection (pictures, sculptures, and antiquities); the arsenal; the Liechtenstein gallery, and count Harrach's collection (pictures), and the Albertina (drawings and engravings), the latter containing the original study of Raphael's "Transfiguration." The polytechnic institution (for instruction in practical science, etc.) is attended by about 1000 pupils, and in connection with it there is a capital technological museum. The university (founded 1365) has upward of 3,900 students on its roll, a staff of over 200 professors and lecturers, and a library of 212,000 vols. As a school of medicine it is celebrated all over the continent. The principal places of public resort for the lower classes are the gardens of the palace at Schönbrunn, the *Augarten*, and the *Prater*, the latter being probably the largest park in Europe. The buildings of the great exhibition of 1873 were in it. The nave of this immense exhibition was 2,952 ft. long, and in the center of it was a great rotunda, designed by Mr. Scott Russell, 344 ft. diameter. Only this rotunda, and the part of the buildings immediately connected with it, are to remain standing permanently. Although possessing many points of interest, especially in its eastern exhibits, the exhibition did not succeed financially. Vienna contains eight or nine theaters, of which the best three, including the magnificent opera-house, are in the *Stadt*. The manufacture of silk stuffs, and also shawl-weaving, are important branches of Viennese industry. The manufacture of meerschäum pipes, gloves, and all kinds of fancy leather articles, is also carried on greatly. Very extensive works are at present in progress to bring the Danube close to the city, and improve its navigation. When these are completed, a new suburb will spring up to the n.e., and Vienna will be in many ways very much altered. Pop. 75 of Vienna and suburbs proper, about 850,000; but including the outlying villages (as, e.g., Fünfhaus, Döbling, etc.), in which many well-to-do Viennese reside, the population is a little over a million.

VIENNA, TREATIES, ETC., OF. This capital, from its central position, and from the prominent part which Austria has always taken in the wars of modern Europe, has been oftener selected than any other city (Paris perhaps excepted) as the meeting-place of the representatives of the various European nations. The *first* treaty of Vienna (April 30, 1725) was a mutual guaranty of their dominions by the emperor Charles VI. and Philip V. of Spain; besides which, the former agreed to aid in the recovery of Gibraltar from Britain, and to aid the pretender in supplanting George I., in consideration of the latter guaranteeing the pragmatic sanction. The *second* treaty (Mar. 16, 1731) was a joint guaranty of the pragmatic sanction by George II. of Britain and the states of Holland. The *third* (Nov. 18, 1738) was a similar guaranty by Louis XV. of France in consideration of the reversion of Lorraine and Bar (to be given meantime to Stanislas, the ex-king of Poland), as well as a settlement of the Polish succession dispute, and a

re-arrangement of the possessions of Austria, Spain, and Sardinia, in Italy. The *fourth* treaty (Oct. 14, 1809) was concluded between France and Austria, after the battle of Wagram, and the armistice of Znaim, by which the latter agreed to resign some districts on the western border of the archduchy to Bavaria; Goritz, Friuli, Trieste, Carniola, and parts of Croatia, Carinthia, and Dalmatia, to France, these provinces to be formed into the government-general of Illyria; some districts of upper Lusatia to the king of Saxony; western Galicia, with Cracow and Zamocz, and a share in the salt mines of Wieliczka, to the grand duchy of Warsaw; and the eastern corner of Galicia to Russia; a total loss to Austria of 58,170 sq.m., with a pop. of 3,500,000, and all her sea-ports.

The next, and by far the most important meeting of the representatives of European nations, was the *congress of Vienna*, which was held here after the first treaty of Paris, for the general settlement of the affairs of Europe. The congress, which first met on Sept. 30, 1814, was composed of the czar Alexander I., of Russia, with count Nesselrode; the king of Prussia, with Hardenberg; lord Castlereagh, and afterward the duke of Wellington, as representatives of Britain; prince Metternich for Austria; count Talleyrand for France; as well as representatives of Spain, Portugal, Sweden, Rome, Germany, and all the other minor powers, who were interested personally in the deliberations; the total number of those who assisted at the congress being about 500. But the representatives of the minor states, who had expected a species of European parliament, to which all would be admitted, were sadly disappointed by the preliminary resolution of the great powers to constitute two committees, one of which would deliberate on the affairs of Germany; and the other, composed only of the representatives of Austria, Prussia, Russia and Britain, would discuss the affairs of Europe generally, decide respecting the partition of the conquered districts (formerly belonging to France and her allies), and the frontier of each European sovereignty. To this latter council, Talleyrand, by the influence of Castlereagh, who early saw the necessity of a counterpoise to the influence of Russia and her follower, Prussia, in the conferences, was admitted (Oct. 5); and three days after, it was increased by the representatives of Spain, Sweden, and Portugal. The first resolution of the European committee, to rearrange Europe so as to leave the parties directly interested nothing more to do than give their adhesion to the arrangements made for them, being an arrogation of sovereignty over all Europe, was loudly exclaimed against; but the congress was one of rulers and *their* representatives, and not of the nations and *their* representatives, so the indignant clamor which rose on all sides was quite unheeded. The points which were at once and unanimously settled were—the constitution of Belgium and Holland into one kingdom (*the kingdom of the Netherlands*); the annexation of Norway to Sweden; the restoration of Hanover, with a large slice of Westphalia, to the king of Great Britain; of Lombardy to Austria; and of Savoy to Piedmont. But the question as to the disposal of Poland, Saxony, and Genoa, were not so easily settled. Russia and Prussia, overweeningly vain of the prominent share they had had in crushing Napoleon, were bent on aggrandizement of the most extravagant sort; the former loudly insisting on obtaining the whole of the grand duchy of Warsaw (see *POLAND*); while nothing less than the whole of Saxony, and some of the trans-Rhenish provinces of Westphalia would satisfy the latter; and both significantly hinted at the proximity of their colossal armies, with the view of aving the other powers into compliance. But Castlereagh was not the man to be so influenced; and while steadily refusing to yield an iota to such preposterous pretensions, he joined with Metternich and Talleyrand in a secret treaty, offensive and defensive, Feb. 3, 1815; which was cordially acceded to by Hanover, Sardinia, Holland, and Bavaria. The news of this agreement soon leaked out, and produced a considerable modification in the pretensions of the northern powers. At last it was agreed that Prussia should obtain a portion of Saxony (now Prussian Saxony), Posen, Cleves, Berg, the greater part of the left bank of the Rhine as far as the Saar, and Swedish Pomerania; and cede East Friesland, Hildesheim, etc., to Hanover, Anspach and Baireuth to Bavaria, and Lauenburg to Denmark; while with the exception of Posen, Thorn, and those parts of the grand duchy which had been (1809) taken from Austria, Poland was to be erected into a kingdom separate from Russia, but under the rule of the czar. Austria recovered the cessions which she was forced to make in 1809, obtaining also the Valtelline from Switzerland, and the establishment of collateral Hapsburg lines in Tuscany and Piombino; while Maria Louisa obtained Parma. The pope was replaced in his former position as a temporal sovereign; the ancient constitution of Switzerland re-established; and Genoa—despite the strongly expressed aversion of its inhabitants—incorporated with Sardinia. The news of Napoleon's return from Elba somewhat hurried the conclusion of these multifarious arrangements, yet the negotiations were not interrupted; Metternich's scheme for a new confederation of the German states (the same which has continued till 1866) was unanimously agreed to, the question of mutual indemnities, rectifications of frontier, etc., being subsequently settled (July 20, 1819) at Frankfurt, by a territorial commission composed of representatives of the four great powers. The questions of the slave trade and of the free navigation of the Rhine and its tributaries, were brought up by England, and also satisfactorily settled. Finally, a formal treaty (*the fifth treaty of Vienna*) was drawn up and signed, June 9, 1815.

VIENNA PASTE is a preparation which is extensively used as an encaustic, although it is not contained in the Pharmacopœia. A mixture, termed *potassa caustica cum calce*

(caustic potash with lime), which is itself a caustic, and is much employed for producing issues, is first prepared by mixing equal weights of caustic potash and freshly burned lime in a warm mortar, and rubbing them to a powder, which should at once be placed in an air-tight bottle. The caustic powder of which Vienna paste is made is obtained by similarly mixing 50 parts of the preceding compound with 60 of quick-lime. It must be kept in a well-stoppered bottle; and when required for use, the powder is made into a soft paste with a little spirit, and applied to the part it is desired to cauterize. It is much employed by some physicians in certain affections of the womb; and is one of the best applications to an indurated chancre. See SYPHILIS.

VIENNE, an interior dep. in the w. of France, bounded on the n. by the depts. Maine-et-Loire and Indre-et-Loire, and on the w. by Deux-Sèvres, which intervenes between this and the maritime dep. of Vendée. Area, 2,680 sq. m.; pop. '76, 330,916. The Vienne, an affluent of the Loire, is the principal river, and all the other streams of the dep. are tributary to it. It flows from s. to n., and receives the Clain, Gartempe, and Creuse—of these, the last only is navigable. The surface is flat, with a gradual slope toward the north. The country consists almost wholly of fertile plains, fine pasture-lands, and extensive forests. The climate is soft, temperate, and healthy. Grain is cultivated in greater quantity than is required for local consumption. On an average 13,200,000 gallons of wine are produced annually. In general, however, agriculture is in a backward state. The mineral riches of the department consist principally of iron and manganese, and numerous quarries of building and others stones, including lithographic stones, which are finer and harder than those of Munich. The dep. is divided into the five arrondissements of Poitiers, Châtellerault, Civray, Loudun, Montmorillon. Poitiers is the capital.

VIENNE, one of the most ancient t. of France, in the dep. of Isère, on the left bank of the Rhone, 19 m. s. of Lyons by railway. The river Gère passes through the town, and here joins the Rhone, after having supplied motive-power to a number of mills and factories. Vienne was the chief town of the Allobroges, is mentioned by Cæsar (*De Bello Gallico*, vii. 9), and by Martial, who terms it *opulenta Vienna*. At the time of the Roman emperors, it was a rival of Lyons. Besides numerous water-conduits, etc., of Roman construction, there is a temple supposed to have been dedicated to Augustus, and which is now used as a museum, and contains a number of ancient Roman remains. There are also a Roman arch, remains of a theater, and an obelisk, called *L'Aiguille*, 72 ft. high; and the cathedral of St. Maurice, a stately Gothic edifice, with much delicate carving. Manufactures of coarse woollens are carried on; and there is a good trade in wine. Pop. '76, 22,950. In 1312 a council was held here, in which pope Clement V. pronounced the suppression of the order of the Templars.

VIENNE, HAUTE, an interior dep. of France, bounded on the w. by the depts. of Vienne, Charente, and Dordogne; area, 2,130 sq. m.; pop. '76, 236,061. It is watered by the Vienne and its tributaries—the chief of which is the Gartempe. The surface is for the most part level; but traversed by ranges of low hills, of which the *Monts du Limousin*, which traverse the s. of the dep. from e. to w., rise in their highest summit to 3,000 feet. The *Mont de Puy-Vieux*, the highest in the dep., is 3,200 ft. above sea-level. The climate is cold, humid, and frequently foggy. The soil is not fertile, and agriculture is in a very backward condition. There are, however, extensive meadows, and the domestic animals are reared in great numbers. Mines of iron, lead, and copper are worked. The dep. is divided into four arrondissements—Limoges, Bellac, Rochechouart, and Saint-Yrieix; capital, Limoges.

VIERSSEN, a prosperous and beautiful manufacturing t. of Rhenish Prussia, 18 m. w. of Düsseldorf. Vierssen has extensive manufactures of woolen and flax, as also of woolen, damask, silk and velvet stuffs, and ribbons; there are also dye-works and many other industries, which give employment to thousands of workmen. The population of Vierssen has more than doubled itself within the last few years, being in '75, 19,705.

VIERZON-VILLE, an ancient and handsome t. of France, in the dep. of Cher, 48 m. s. of Orleans. Vierzon-Ville has blast furnaces, forges, and steel-refineries, manufactures of porcelain and earthenware, and a trade in cereals and wine. Pop. '76, 8,995.

VIETA (otherwise given VIET, VIETTE, or DE VIETTE, and by himself Latinized into VIETÆUS), FRANÇOIS, the most eminent French mathematician of the 16th c., was b. at Fontenai-le-Comte, near La Rochelle, in 1540. Of his early life and education we know nothing, and almost all our acquaintance with the details, meager as they are, of his personal history, is derived from the records of his friend, De Thou (q.v.). Vieta was employed throughout his whole life in the service of the state under Henry III. and Henry IV., and devoted only his hours of leisure to the study of mathematics and other subjects—affording an excellent illustrative argument against the belief that abundant leisure is essential to high eminence, and in favor of the contradictory theory that mental work of whatever sort tends to prepare the mind for any other species of thought-labor. Vieta was a zealous Roman Catholic, and a strenuous supporter of the doctrine of the divine right of kings. His genius and persevering industry brought him prominently into notice on various occasions. During the war against the Spaniards, the latter, to preserve as much as possible their communications with their numerous

outlying possessions, and prevent the French from profiting by information from intercepted letters, adopted a species of cipher (see CRYPTOGRAPHY) of more than 500 characters, each varying from time to time in its signification. Some specimens being intercepted, were submitted to Vieta, who after a time discovered a key to the cipher, to the great discomfiture of the Spaniards, who, incapable of accounting for the discovery otherwise, attributed it to magic; though the story that Vieta was summoned to Rome to defend himself before the pope against the charge of having dealings with the devil may safely be regarded as untrue. Vieta's next prominent appearance was as an assailant of the Gregorian calendar, in opposition to which he published (1600) a "true Gregorian calendar," which was with justice considered by his contemporaries as inferior to that which obtained the papal sanction. However, Vieta did not, or would not, see his error, and attacked the Jesuit Clavius, to whom the pope had intrusted the compilation of the calendar, in a bitterly abusive manner; displaying, however, such a mastery of knowledge, that one of Clavius's defenders was led to sympathize with the unfortunate Jesuit who had to withstand the assault of one who was at once a lawyer, theologian, mathematician, orator, and poet. Vieta, however, is almost exclusively recognized by posterity as a mathematician; yet, though worthy to rank among the highest of this class, immediately after such men as Newton and Lagrange, the incessant state of politico-religious turmoil in which France was kept during his life, and the fact that all his works printed during his life were set up at his own expense, and distributed among his friends, have hitherto hindered a general recognition of his high merit. The Italian tabulators of the progress of mathematical science have thus had a good opportunity of decking out their national idols (Cardan, especially) with plumes stolen from the obscure French investigator. The claims of Vieta, however, are now becoming more and more generally recognized. He is indisputably entitled to be considered as the creator of modern algebra, which he established on the footing of a purely symbolical science; he applied his algebra to the extension of trigonometry, discovered the relations of multiple angles; and he extended the ancient process of extracting square and cube roots to the solution of all equations, an extension which has been since modernized and modified, and now appears as *Horner's method*. Besides, he proved his superior mathematical powers, by solving problems which had puzzled Apollonius, Regiomontanus, etc.; and was acknowledged by the mathematicians of Belgium and Italy as their master. Yet, strange to say, his own countrymen, the French, have so little knowledge of the surpassing talents and achievements of Vieta, that, omitting all intelligent mention of his peculiar successes, they ascribe to him praises due to his Italian predecessors, and to his great English successor, Newton. Most of Vieta's works were collected by Schooten, and published by the Elzevirs, at Leyden, in 1646. Two other works of his have been recently discovered, the *Harmonicon Cæleste* and the *Canon Mathematicus*, the latter the first table in which the trigonometrical functions of an angle are completely given. Of the first, two MSS. exist; while the second was printed and circulated according to Vieta's usual fashion, and has long been a bibliographical curiosity; but neither has yet been published. See Knight's *Eng. Cyc.* art. "Vieta."

VIEUXTEMPS, HENRI, b. France, 1820; displayed proficiency on the violin when but a child, and was a pupil of De Bériot and Reicha. In 1830 he appeared at Paris and Vienna in public concerts, with great success, and has since been before the public as one of the masters of his instrument. He visited America in 1843, 1855, and 1870, appearing on the last occasion in concerts with Mlle. Nilsson.

VIEYRA, ANTONIO, 1608-97; b. Lisbon; entered the Franciscan order, and became the foremost preacher in his country. He went on diplomatic missions to various foreign courts, and in his last days was a missionary to Brazil. His works are, *Sermons* (1688-1754); *History of the Future* (1718); and *Letters* (1735-46).

VIGAN, LE, a small, prettily situated t. in the s. of France, in the dep. of Gard, 45 m. w.n.w. of Nîmes. It carries on a trade in wine, oil, mules, horses, and silk. Silk and cotton fabrics are manufactured; and hides are tanned, known as Vigan hides. Pop. '76, 4,340.

VIGE VANO, a t. of Northern Italy, in the province of Pavia, 15 m. s.e. of the town of Novara. It stands on a rising ground on the banks of the Mora, not far from the Ticino. It manufactures silk, linen, and cotton fabrics, and has an active trade in grain and wine. Pop. 18,000.

VIGIL (Lat. *vigilia*, Fr. *veille*, I watch), a preparatory time of devotion, which, by very ancient Christian usage, went before the more solemn festivals, and especially Christmas, Easter, Pentecost, and the principal martyrs' days. In English, it was called "eve" or "even," a name which is still retained in relation to several festivals, as Christmas eve, Hallow-e'en, etc. The observance is traceable in the very earliest centuries, and was established everywhere in the 4th and 5th centuries. It is one of the usages of his time against which Vigilantius inveighs, and which Jerome vindicates in his celebrated *Letter against Vigilantius*. On the day before the great festivals, which seems from the first to have been held as a fasting-day, the people assembled in great multitudes. The services proper to the vigil, but having a certain bearing on the coming festival, were celebrated; the night was spent chiefly in the church and in prayer, and other devotional

exercises; but abuses arose out of these night-watches, which led to their suppression, as well as to the abolition of certain festivities which grew up in connection either with the vigil or with the feast itself. The observance of vigils is still retained in the Roman Catholic church, and with it all the ecclesiastical offices, together with the fast, at least in the great vigils of Christmas, Easter, Pentecost, Saints Peter and Paul, Assumption, All-Saints, etc.; but all the other details of the celebration have gone into disuse. In the English prayer-book, the "vigils or evens" of the chief festivals of our Lord, of the blessed Virgin Mary, and of the Apostles are retained in the calendar; but they have no special services appointed for them, nor any other celebration. See Blunt's *Annotated Common Prayer*, p. 28.

VIGILIUS, b. in Rome, was, while a deacon, nuncio at Constantinople during the pontificate of Sylvester. Theodora, wife of Justinian, determined to depose Sylvester, and sent Vigilius to Rome to procure his imprisonment and exile. Vigilius was, at Theodora's suggestion, elected pope, 537. In 547 he was summoned to Constantinople by Justinian to sustain him against the western bishops in his condemnation of the "three chapters," i.e. of the writings of Theodore of Mopsuestia, Ibas of Edessa, and Theodoret. Vigilius considering the writings orthodox, refused to condemn them, and was banished to the island of Proconnesus, from which he was recalled, 554. He died on his way to Rome.

VIGNETTE (Fr. little vine, a tendril; Lat. *viticula*), a term originally applied to the flourishes in the form of vine tendrils, branches, and leaves with which the capitals in ancient manuscripts were often surrounded. Similar decorations were introduced into printed books, and all kinds of printers' ornaments, such as head and tail pieces, came to be designated as vignettes. More recently, the name has been applied to any small engraving (as on the title-page of a book), design, or even photograph, which is not circumscribed by a definite border.

VIGNOLA, GIACOMO BAROZZIO DA, 1507-73, b. Modena; studied painting at Bologna and architecture at Rome, and under Primaticcio in France. He returned to Bologna, and was chosen as the architect of several palaces and public buildings. In 1550 he was made papal architect by pope Julius III., and the latter part of his life was spent in Rome, where he designed the Caparola palace and the church of the Jesuits. He became the architect of St. Peter's after the death of Michael Angelo, and designed the two lateral cupolas. The designs for the restoration of the Spanish Escorial were his work. He was the author of *The Five Orders of Architecture* and *Practical Perspective*, still standard works.

VIGNY, ALFRED COMTE DE, a French poet and novelist, was born at Loches in Touraine, March 27, 1799, and educated at Paris. After spending some time as a soldier, he married, in 1826, a wealthy Englishwoman; and two years later, withdrew from the army, in order to devote himself exclusively to literature. He died Sept. 13, 1863. Vigny belongs to the romantic school, but is free from all their extravagance of style and sentiment. No modern French poet exhibits an equal refinement and delicacy. His principal works are *Poèmes* (1822); *Poèmes Antiques et Modernes* (1824-26), among which are his famous *Moïse*, *Dolorida*, and *Elza*; *Cinq-Mars* (1826), a historical romance of the time of Louis XIII., which is much admired in France, and has gone through more than a dozen editions; *Stello ou les Diables* (1832); *Servitude and Grandeur Militaires* (1835)—two very striking and suggestive novels; *La Maréchale d'Ancre*, and *Chatterton* (1835)—dramas of considerable merit. Beside these, he published *Consultation du Docteur Noir* (1856). A posthumous work appeared in 1864, entitled *Les Destinées, Poésies Philosophiques*.

VIGO, a co. in w. Indiana, having the Wabash river and the state line of Illinois for its w. boundary; 410 sq. m.; pop. '80, 45,656—40,867 of American birth; 1501 colored. Co. seat, Terre Haute.

VIGO, an ancient town and sea-port on the n.w. coast of Spain, beautifully situated on a bay of the same name, about 85 m. n. of Oporto. Its delicious climate renders it important as a medical station; and its position on the slopes of a hill, overlooking a charming bay, and forming the center of a scene, oriental in its wealth of palms, orange-groves, flowers, and orchards, is likely to tell in its favor as a residence for the rich. Its old walls and gates; its winding, narrow streets; its houses, white-washed, or colored red or green; the craft which frequent its harbor, and the picturesque dresses of the peasants, are delightful to the artist, as well as to the ordinary observer. The country in the vicinity is exceedingly rich, and fruits, corn, wine, and oil abound. The trade of the port—which is also a harbor of refuge—is increasing. About 2,500 vessels, of 300,000 tons, enter and clear the port yearly. Pop. nearly 9,000.

The bay of Vigo has an inland sweep of 20 m., and is 5 m. wide at its mouth. The town has frequently been attacked by the English: by Drake in 1585 and 1589; by the duke of Ormond, Rooke, and Stanhope in 1702; and in 1719 by lord Cobham.

VIHARA (which, in Sanskrit, means "walking for pleasure or amusement") is, with the Buddhists (q.v.), the name of their temples and convents. Originally, it designated the hall or halls where the Buddha S'akyamuni, and the priests by whom he was accompanied, used to meet; but when these halls gradually were converted into temples, the

name of *vihâra* was applied to them; and when, in time, the temples became the center of a number of habitations in which the priests belonging to the temples resided, the whole monastic establishment was comprised under the same name. Properly, therefore, the *Vihâra* merely designates the Buddhistic temple, and it is generally used in this restricted sense. Such *vihâras* are in Ceylon permanent structures, the walls being plastered, and the roof covered with tiles, even when the dwellings of the priests are mean and temporary. Near the entrance are frequently seen figures in relievo, representing the guardian deity of the temple. Surrounding the sanctum there is usually a narrow room, in which are images and paintings; and opposite the door of entrance there is another door, protected by a screen; and when this is withdrawn, an image of Buddha is seen, which occupies nearly the whole of the apartment, with a table or altar before it, upon which flowers are placed. The walls of the *vihâra* are covered with paintings, and its stories generally illustrate some legend of Buddha's life. Some *vihâras* are built upon rocks; others, and among these the most celebrated, are caves, in part natural, with excavations carried further into the rock. The cave-temple at Dambulla is one of the most perfect *vihâras* in Ceylon (see the description of it by Forbes in the *Ceylon Almanac* (1834). On the continent of India, the finest specimens are those at Ajunta, Ellora, Salsette, and Junir. Sometimes no land is attached to the *vihâras*, but sometimes also they are rich in land; and in the case of one of the *vihâras* in Kandy, there is an area belonging to it, which, under the native government, was regarded as a sanctuary for malefactors. See R. Spence Hardy, *Eastern Monachism*, and the authorities quoted there (London, 1850).

VIKING (plural **VIKINGS**), a name given to the piratical Northmen who infested the coasts of the British islands and of France in the 8th, 9th, and 10th centuries. This word is quite unconnected with "king," being derived from the Scandinavian *rik*, a bay; and this class of marauders were so called because their ships put off, not like the king's ships, from the lawful harbor, but from the bay. See **NORMANS**.

VILAYET, the name given to the provinces of Turkey. Each vilayet is governed by a governor, and council, and is subdivided into sanjaks or livas, and again into cazas.

VILKOMIR, a t. of w. Russia, in the government of Kovno, on the Swenta, 130 m. s.e. of Riga. It was a flourishing town in the 13th c., and continued prosperous till the 17th c., when it began to decline, in consequence of the wars with Sweden, Russia (Vilkomir being at that time a Polish town), and the Cossacks. The town contains an ancient church of the 13th century. Flax is exported to Riga; but the trade is not extensive. Pop. '67, 9,908.

VILLA, a term now applied to detached suburban residences with about one acre or less ground attached to them. In the time of the Romans, the villa was a cluster of buildings in the country, forming a sort of private town, and containing in one the residences of the proprietor, farmer, and servants, and all the necessary offices and other accommodation for the cattle—the gardens, pleasure-grounds, etc. These villas were sometimes of enormous size, but they do not seem to have been built on any regular architectural plan, so as to produce an effect commensurate with their extent. The villa was divided into several parts, according to their uses: 1. The *villa urbana* was the portion in which the proprietor resided, and was laid out, as the name indicates, in a manner very similar to that of a town-house. The size and style of this part depends, of course, on the pleasure or quality of the master. It contained the eating-rooms, bed-chambers, baths, covered porticos, walks, and terraces. 2. The *villa rustica* was the portion set apart for the stabling, servants, etc., and the accommodation for the cattle. Its extent depended on the size of the farm and number of cattle. 3. The *villa fructuaria* was for the vine, oil, and other produce. The number of servants accommodated in a villa was very great. The livery-servants, along with the gardeners for the pleasure-grounds, comedians, musicians, etc., belonged to the *villa urbana*. The *villicus* presided over the others, including the servants for tilling the land, the herdsmen, shepherds, goatherds, swineherds, poulterers, etc. There were also frequently several artisans, kept constantly on the premises, such as smiths, carpenters, etc.

VILLA DEL PRINCIPE, or SANTA MARIA DEL PRINCIPE. See PUERTO PRINCIPE.

VILLAFRANCA, a small t. of northern Italy, in the province of Verona, and 9 m. s.w. of the city of that name, on the left bank of the Tartaro. It was formerly a place of great strength; but it is now notable chiefly as the place where the treaty of peace between the emperors of France and Austria, which brought the Italian war of 1859 to a close, was signed June 11 of that year. Pop. (including the surrounding hamlets), 7,500.

VILLAFRANCA DE PANADÉS (of the bakers), a dull, backward t. of Spain, in the province of Tarragona, in Catalonia, about 30 m. w.s.w. of Barcelona. It contains some very early palaces of the kings of Aragon, not, however, of much interest. Pop. about 5,500. Villafrañca de Panadés, founded by Amilcar, was the earliest Carthaginian settlement in Catalonia.

VILLAIN. See **SERF**.

VILLA'NI, GIOVANNI, 1280-1348; b. Florence; visited many parts of Europe; became celebrated as a historian and diplomat, and considered an authority on the Tuscan language. He belonged to the Guelph party, and filled many offices in the people's gift. He died of the plague. A chronicle of Florence (*Istorie Fiorentine*), in 12 books, was published in 1562-87, the 13th vol. being added by his brother Matteo, whose son Filippo continued it to 1365. It appeared in 7 vols. (1802), with a eulogy of Villani by Massai.

VILLA-REAL, a t. of Valencia, Spain, in the province of Castellon, and 5 m. s. of the city of that name, about 3 m. distant from the Mediterranean shore. It has wide, straight streets, laid out at right angles to one another, and contains flour and oil mills, woolen factories, and brandy distilleries. Pop., 7,750.

VIL'LARI, PASQUALE, b. Naples. 1827. When in the university he became involved in the revolutionary movement of 1848-49, and was forced to leave the country. He resided at Florence for some years, and there published his *Life of Sisonarola* (1859-61), which has been translated into many languages. He was afterward professor of modern history at Pisa and at Florence, and has published many papers on education and of a critical nature. He has for several years been a member of the chamber of deputies and of the council of instruction.

VILLA RICA, a city of Brazil, capital of the province of Minas Geraes, called also Ouro Preto (q.v.).

VILLARS, CHARLES-LOUIS-HECTOR, Duc de, Marshal of France, one of the most illustrious of the great captains of Louis XIV.'s time, was born at Moulins, in the department of Allier, May 8, 1653. Being of a noble family, his education, with a view to the military profession, was prosecuted at the college of Juilly, and he subsequently volunteered into the army which was employed in Holland; and having attracted Louis XIV.'s attention by his daring courage and striking elegance of figure, obtained a troop of horse in 1672, served for two years under Turenne in Germany, and after the battle of Seneffe received a regiment of cavalry, when yet in his 21st year. After a further term of service under Luxembourg and Crequi, he returned to Paris with the reputation of being one of the most promising young officers of the time. During the next ten years (1678-88) he was employed in diplomatic service, chiefly at the court of Bavaria. In 1688 Louvois appointed him commissary-gen. of cavalry; and, in the war which immediately followed the league of Augsburg, placed him at the head of the cavalry in Flanders. He was subsequently distinguished in the campaigns on the Rhine and in Italy. From 1699 till 1701 he represented France at the court of Vienna, and watched with sleepless vigilance the tortuous policy of the Austrian ministers, foiling by his penetration their most promising schemes, till he came to be regarded personally with extreme dislike, was shunned by all the court (prince Eugene excepted), and even his life threatened. On his return, he was employed in Italy under Villeroi; and, after a brief period of service under Catinat, was for the first time (1702) raised to independent command, when he was sent to succor the elector of Bavaria, who had taken up arms on the side of France. Toward the close of 1702 Villars crossed the Rhine, defeated the markgraf of Baden at Friedlingen, took Treves, Traerbach, and Nancy; and early in the following year, again crossed the Rhine, traversed the almost impassable defiles of the Black Forest, and, debouching from the mountains at Villingen, joined the elector near Duttlingen, on May 12. His bold and well-conceived scheme for carrying the war into the enemy's country by advancing upon Vienna, while so many Austrian troops were employed on the middle Rhine, in Italy, and against Ragotski in Hungary, was foiled by the stupid obstinacy of his colleague, the elector; and after his skill and genius had been tasked to the utmost to keep the Austro-Germans under the markgraf of Baden and Stirum at bay, and he had been relieved by the return of his ally (who had been soundly beaten by the Tyrolese mountaineers), he reopened his line of communication westward, and, leaving Marsin in command, returned in disgust to France. He was next commissioned to put down the insurrection of the Camisards (q.v.), which had been zealously fostered, for strategic reasons, by English and Dutch agents. Villars's manly moderation and soldierly frankness fairly won over Cavalier, the ablest of the insurgent leaders; and might, with his consummate military skill, have suppressed the insurrection. However, he was not allowed to manage matters for himself, and all he could do was to reduce the ferment to insignificant proportions. Villars was then sent to watch over the north-eastern frontier, and took post on the heights of Fronsberg, when Marlborough advanced upon him with 110,000 men; but Villars had shown such skill and strategy in the selection and fortification of his position, and such wise self-control in remaining strictly on the defensive, that the great English hero declined to risk an attack, and retreated; upon which Villars burst into Alsace, captured the enemies' reserves of supplies and artillery, and advanced to Rastadt and Stuttgart. The withdrawal of some of his troops to re-enforce the north French army forced him to recross the Rhine; yet, with his small army, he, in 1708, completely foiled all the attempts of prince Eugene to penetrate into France. In 1709 he was sent to oppose Marlborough in the north; but unfortunately, at the commencement of the battle of Malplaquet (q.v.), he was severely wounded, carried off the field insensible, and rendered unfit for service till the following year; and the reopening of his wound in the autumn of 1710 forced him again to resign the command. But in 1711 he returned to his post, headed the last

army France could raise, and with it fell upon the British and Dutch under Albermarle, who were intrenched at Denain (July 24, 1712), carried their intrenchments sword in hand, and captured the most of them; he then turned upon prince Eugene, and drove him under the walls of Brussels. This magnificent series of successes saved the national honor, and even life, of France, and brought about the peace of Rastadt (see UTRECHT), which Villars signed as plenipotentiary, May 6, 1714. After the peace, he became, at court, the principal adviser on military affairs and on questions of foreign policy; was a strong opponent of Law's financial measures; but, through the intrigues of Fleury, lost favor at court. The outbreak of war in 1732, however, brought out the old hero from his retirement, and with the title of "marshal-gen. of the camps and armies of France" he went to head the French army in the Milanese. The campaigns of 1733-34 showed that the weight of years had left Villars's military genius and spirit untouched; but the ill-behavior of his ally, the king of Sardinia, determined him to solicit his recall; and he accordingly set out for France; but falling ill at Turin, he died there, June 17, 1734. Villars was the last of the great military geniuses of the French monarchy, and was wholly free from the restless anxiety for *éclat* which detracts from the merits of so many of them. As a general, he possessed in a high degree rapidity of apprehension, skill in disposition, and promptitude (without precipitancy or rashness) in action. Humanity and sincerity, joined to thorough self-reliance, may be traced through the whole of his long and eventful life; and the two latter qualities occasionally exhibited themselves so prominently at court as to cause the "professional courtiers" of Louis XIV. to look askance upon him as a "rude and *immodest*" person. His memoirs have been printed in Holland, and his autobiography by Anquetil.

VILLARSIA, a genus of plants of the natural order *gentianaceæ*, the species of which are widely distributed over the world, and are either aquatic or marsh plants, with entire leaves and yellow flowers. *Villarsia nymphaeoides* is a native of England, but rare. It is more common in many parts of Europe, from Denmark to the Mediterranean, and is very abundant in Holland, often covering large tracts of the canals with its beautiful flowers and leaves. It abounds in the south of Siberia. It is easily cultivated.

VILLEFRANCHE, a t. of France, in the department of Aveyron, is seated on the river of that name, in a valley surrounded by hills, 85 m. n.e. of Toulouse by railway. It contains many interesting houses of the 15th and 16th centuries, and, in the market-place, a large collegiate church, in the pointed Gothic style of that period, and carries on important manufactures of copper wares, of gray cloths, and packing. Iron works and foundries are in operation. Pop. '76, 7,819.

VILLEFRANCHE-SUR-SAÔNE, a small, industrious t. of France, in the department of Rhone, stands on the Morgon, an affluent of the Saône, 18 m. n. of Lyon, on the Paris and Marseilles railway. It is surrounded by a district studded with charming country-seats, and consists chiefly of a handsome street a mile and a quarter in length. Manufactures of cotton goods are carried on, and there is a great trade in wines, horses, cattle, hides, and cloth. Pop. '76, 11,994.

VILLÈLE, JEAN BAPTISTE SÉRAPHIN JOSEPH, DE, 1773-1854; b. Toulouse, France; entered the navy, and made a fortune in the colonies. After being mayor of Toulouse, and representing that city in the deputies, he was appointed minister of finance in 1821. The next year he was given the title of count and made president of the council and minister of foreign affairs. During his administration, but against his will, an expedition was sent to Spain to restore Ferdinand VII. in 1823. He was in high favor with Charles X., whom his ultramontane and extreme royalist policy helped to dethrone. He made the Haytiens pay 150,000,000 francs for their independence, and reduced the interest on the public debt; but his reactionary measures, his restrictions on the press, and his partiality for the Jesuits led to his retirement from the ministry in Jan., 1828.

VILLEMAIN, ABEL FRANÇOIS, a distinguished French scholar and writer, b. at Paris, June 11, 1790, and educated at the lycée Impérial (now the lycée Louis-le-Grand). In 1810 he was appointed extraordinary professor of rhetoric at the lycée Charlemagne; and shortly after, maître de conférences de littérature Française et de versification Latine, at the école Normale. During the years 1812-16 three of his literary essays were crowned by the French academy—the *Éloge de Montaigne*, *Avantages et Inconvénients de la Critique*, and *Eloge de Montesquieu*. In 1816 he was appointed to a chair of modern history at the Sorbonne, as assistant to Guizot; but, in the course of the same year, was transferred by Royer-Collard to the chair of eloquence, which he held till 1826. In 1819, he published in 2 vols. his *Histoire de Cromwell d'après les Mémoires du Temps et les Recueils Parlementaires*—a work written in a calm, liberal, and wise spirit. Louis XVIII. took notice of the author, and Villemain was induced to enter on a political career. The post assigned to him was rather a delicate one, that of chef de l'imprimerie et de la librairie. Under the ministry of M. Decazes, he also held the office of maître des requêtes to the council of state, and in 1820 was decorated with the legion of honor. Two years later appeared his translation (with preliminary essay and notes) of the *Republic* of Cicero; and in 1825, a drama entitled *Lascaris, ou les Grecs du XV. Siècle*, and an *Essai sur l'Etat des Grecs depuis la Conquête musulmane*. In 1827, having gradually passed over to the ranks of the liberal opposition,

he was charged, along with Lacretelle et Chateaubriand, to draw up the petition addressed by the French academy to Charles X. against the re-establishment of the censorship of the press! The result of this hardihood was the loss of his appointment as *maître des requêtes*, and, in consequence, a vast increase of his popularity as a lecturer at the Sorbonne. In the beginning of 1830 he was sent to the chamber of deputies by the electoral college of Evreux, took his seat among the liberal party, signed the famous address of the 221, and was altogether very prominent and active in those movements which brought about the constitutional monarchy of Louis Philippe. But he was too sober, unsympathetic, philosophical a politician, too much a *doctrinaire* of the Guizot school, to be a favorite with the excitable masses, and he only sat in the chamber for one year. In 1831 the king named him member of the royal council of public instruction, of which he became vice-president in 1832. The same year witnessed his elevation to the peerage. Villemain held the portfolio of public instruction in the ministries of Soult (1838-40) and Guizot (1840-44); but his health failed under the immense labors of his department, and the impossibility of pleasing so many different parties—the church, the university, the reds, the liberals, the doctrinaires, and the king himself; and, in consequence, he found it necessary to resign. Afterward, Villemain wisely devoted himself to literature alone. His principal works are: *Cours de Littérature Française; Tableau du XVIII. Siècle; Discours et Mélanges Littéraires* (1823); *Nouveaux Mélanges Historiques et Littéraires* (1827); *Etudes de Littérature Ancienne et Etrangère* (1846); *Tableau de l'Eloquence Chrétienne au IV. Siècle* (2d ed. 1849); *Etudes d'Histoire Moderne* (1846); *Souvenirs Contemporains d'Histoire et de Littérature* (1856); *Choix d'Etudes sur la Littérature Contemporaine* (1857); *La Tribune Contemporaine, M. de Chateaubriand* (1857); *Essais sur le Génie de Pindare et sur la Poésie Lyrique* (1859); besides a vast number of *essais*, *études*, *discours*, *notices*, and *rapports*, addressed to the French academy, of which he was perpetual secretary from 1832. Villemain's elaborate *Histoire de Grégoire VII.*, nearly finished at the time of his death, was published in 1872. Villemain died May 8, 1870.

VILLEMESSANT, JEAN HIPPOLYTE DE, b. France, 1812; resided some time in Tours and Nantes; settled in Paris as a journalist, 1840; established the *Sylphide*, and wrote fashion articles for the *Presse*; was connected with several papers in 1848, which were suppressed; founded the *Chronique de Paris*, 1850; revived in 1854 the *Figaro* as a weekly and semi-weekly journal, to which Edmond About, Rochefort, and Henry de Pène contributed. In 1866 he issued a daily, whose circulation in 1870 amounted to 70,000. He published *Mémoires d'un Journaliste*.

VILLENA, a t. of Spain, in the modern province of Alicante, and 37 m. n.w. of the city of that name by railway. The streets are narrow and winding, and are overlooked by an old castle, which has an imposing appearance, owing chiefly to its elevated position. Around the town, the hills are clad with vines, and the country is fertile. A great fair, at which goods are sold to the value of £120,000, takes place here every autumn. Pop. 8,224.

VILLENEUVE, PIERRE CHARLES JEAN BAPTISTE SYLVESTRE DE, Vice-Admiral of France, descended from an ancient and noble family, which has supplied an almost uninterrupted succession of distinguished ornaments to their country, was born at Valensoles, in the department of Basses-Alpes, Dec. 31, 1763, entered the navy in his 15th year, and passed as capt. in 1793. In 1796 he was raised to the rank of "capt. of division" (equivalent to *commodore* in the British navy), commanded the rear-division at the battle of the Nile, and after that disastrous fight, succeeded in carrying off to Malta his own vessel, the *Guillaume Tell*, and four others. In 1804 he was nominated vice-admiral; and in the following year was appointed to the command of the Toulon squadron, with which he succeeded in reaching Cadiz, where he was joined by the Spanish fleet under Gravina. His orders being to attempt the withdrawal of the British fleet from the coasts of Europe, he bore away westward across the Atlantic, reaching the Antilles on May 14, and there making a number of valuable captures. A month afterward, hearing that the British fleet had reached Barbadoes, he at once re-embarked his troops, and returned to Europe, pursued by Nelson. On reaching the Azores, however, he encountered a British squadron, under sir Robert Calder, and a fierce combat ensued, which lasted till dark. On the following morning, neither side cared to renew the engagement (for which Villeneuve was abused by *Le Moniteur*, and admiral Calder was put on trial), and Villeneuve, unable to reach Brest, again returned to Cadiz, where he was strictly blockaded by Nelson. The unjust severity with which he was treated by Napoleon arose from the fact, that the battle off the Azores, and the subsequent blockade of the French and Spanish fleet in Cadiz, had completely ruined Napoleon's scheme for the invasion of England; and the further indignity of being superseded hurried the unfortunate Villeneuve into the desperate resolve of engaging Nelson before his successor could arrive at Cadiz. Besides, by a stratagem of Nelson, he was led to believe that the strength of his enemy was such as to afford him a favorable opportunity of wiping out the disgrace of his former failures, and he accordingly, in superior force, sallied out of the harbor, and engaged in the memorable conflict of Trafalgar (see TRAFALGAR, and NELSON). A passage in the instructions issued to his captains on Oct. 20 sufficiently

shows the irritated state of his feelings—"Every capt. who is not under fire is not at his post, and a signal of recall will be a brand of dishonor to him." Villeneuve, whose vessel the *Bucentaure*, was completely dismayed, was forced to strike his flag, and was made prisoner, and conveyed to England, whence he returned to France in April, 1806. Instead of rendering himself at Paris, he stopped at Rennes, with the view of ascertaining the kind of reception he was likely to meet with from the emperor. The result of his inquiries was unfavorable; and on the morning of April 23 he was found dead in bed, with six knife-wounds in his heart. He had died by his own hand.

VILLENEUVE D'AGEN, or **VILLENEUVE-SUR-LOT**, a t. of France, in the department of Lot-et-Garonne, in a charming valley, 15 m. n. of the town of Agen. The river Lot divides it into two unequal parts, which communicate by a remarkably bold bridge of a single arch. The town, formerly called Gajac, was completely destroyed in the wars of the commencement of the 13th century. It was afterward rebuilt, and then took its present name. A great trade is carried on in wines, prunes, cattle, and iron; there are manufactures of paper, cloth, table-linen, and copper wares. Pop. '76, 9,681.

VILLERS, **CHARLES FRANÇOIS DOMINIQUE DE**, 1762-1815; b. France; served in the French artillery. He opposed the revolution, became a resident of Lübeck in 1797, and endeavored to familiarize Frenchmen with the best works in German philosophy and literature. He was exiled from Lübeck on account of his book relating the outrages by the French when they took that city. He was afterward a professor at Göttingen. Among his works are: *La Philosophie de Kant* (1801); *Essai sur l'Esprit et l'Influence de la Réformation de Luther* (1804).

VILLIERS, **GEORGE**. See **BUCKINGHAM**, **DUKE OF**, *ante*.

VILLIERS, **GEORGE WILLIAM FREDERICK**. See **CLARENDON**, **EARL OF**, *ante*.

VILLOISON, **JEAN BAPTISTE GASPARD D'ANSE DE**, 1750-1805; b. France; went to Venice in 1778, commissioned by the government to look for unpublished Greek manuscripts in the library of St. Mark, where he found an *Iliad* MS. of the 10th c., which he published in 1788. His *Anecdota Græca*, also containing results of his search at Venice, appeared in 1781. In 1783 he printed *Epistolæ Vinarieenses*.

VILNO (often written **VILNA**), a government of west Russia, bounded on the w. by Poland, from which it is separated by the Niemen, and on the e. by the government of Vitebsk, from which it is separated by the western Dwina, and by that of Minsk. Area, 16,320 sq.m.: pop. '70, 1,001,909, mostly Lithuanians, Slavonians, Jews, and Tartars. Only 18 per cent of the whole population are Poles. The rivers are the Vilia, Beresina, affluents of the Niemen, and the Disna, which flows n. into the Dwina. The surface is flat; the highest part being only 1100 ft. above sea-level. The soil, in some places very fertile, consists for the most part of clay and sand. Marshes abound, and there are 400 small lakes. The woods which cover the marshes are the great source of the wealth of the government. The principal trees are fir and pine, and the timber is floated down the Niemen and Dwina for export, and used in the interior for ship-building, etc. The climate is mild. There are a good many manufactories in the government; but agriculture is the principal occupation of the inhabitants, and fairs are numerous and important.

VILNO, an important city of west Russia, capital of the province of the same name, picturesquely situated on the Vilia, 473 m. s.w. of St. Petersburg. Besides its cathedral, it is remarkable for the number of its religious edifices, among which are a mosque, several synagogues, and Lutheran meeting-houses. It formerly contained a university, founded in 1576, but abolished in 1832. Among existing institutions, the chief are the observatory, medical society, museum of antiquities, and theater. The principal articles of trade are timber and corn. Manufactures are not important. Pop. '67, 79,265.

In 1323, Gedimin grand duke of Lithuania, transferred his capital from Troki to Vilno. In 1795, after the final annexation of Lithuania, to Russia, Vilno was made the chief town of the government of the same name.

VINAGO, a genus of *columbide*, the most marked section of that family, having a comparatively stout solid bill, laterally compressed; with a hard, hooked, and inflated tip; the tarsi short, the feet large, and formed for perching or grasping. The species, of which not many are known, are natives of the tropical parts of Asia and Africa. They inhabit forests, and are shy and timid birds.

VINARÓZ, a t. of Spain, in the province of Castellon de la Plana, on the coast of the Mediterranean, 83 m. n.e. of Valencia. Ship-building is carried on, and there are active fisheries. The bay is open and unsafe. Pop. 9,793.

VINCA. See **PERIWINKLE**.

VINCENNES, a commune and market-t. of France, in the dep. of Seine, 5 m. e.s.e. of the Louvre in Paris. In reality, the town is merely a great fortress and barracks, and is famous for its arsenal, and for its school for the practice of shooting. At the latter, the chasseurs de Vincennes, and all the best marksmen of the army, are trained. Pop. '72, 11,031; '76, 18,243.

Vincennes owes its historical importance to its castle and park. The chateau, the main object of interest in the town, is rectangular in shape, and dates from the middle of the 14th century. It was surrounded by nine towers, which were in existence down

to the the year 1808, but of which only one, known as the Donjon de Vincennes, 170 ft. high, and with walls 17 ft. thick, remains. The original building dates from the reign of Louis VII., and had its origin in a hunting-lodge, erected here by that sovereign in 1137. Philippe-Auguste enlarged it, and stocked its woods with wild animals, sent to him by the king of England. Here queen Jeanne (wife of Philippe le Bel), Louis le Hutin, and Charles le Bel, ended their days. Philippe de Valois caused the old mansion to be demolished, and laid the foundations of the more modern chateau, which, from the middle of the 14th c. till the time of Louis XV., was a royal residence, and the birthplace and place of death of many princely personages. After this time it was used as a prison, and among the famous men who have languished within its donjon, may be mentioned Henry IV., the prince of Conde, cardinal de Retz, Mirabeau—who here wrote his translation of Tibullus—and the duc d'Enghien, who was shot in the moat of the castle by order of Bonaparte. There are extensive barracks, known as the New Fort, built 1848-52, and a *salle d'Armes*, with a large collection of all sorts of weapons. In the center of the Bois de Vincennes, a large tract has been cleared as an exercise ground for troops, and for rifle and artillery practice. Other parts of the Bois, which presents much fine scenery, have been embellished with artificial sheets of water, rivulets, and agreeable walks.

VINCENNES, a city of Indiana, U. S., on the left bank of the river Wabash, on the Ohio and Mississippi, and Evansville and Crawfordsville railways, 110 m.s.w. of Indianapolis. It is the entrepot of a rich agricultural country, has a well-endowed university, Roman Catholic bishopric, seminary, and academy, two semi-weekly and three weekly newspapers, and considerable manufactures. A French trading-post was established here in 1710, and a colony in 1735, which lived peacefully with the Indians. Until 1813 it was the capital of the North-west territory. Pop. '70, 5,440.

VINCENNES, JEAN BAPTISTE BISSOT, *Sieur de*, 1688-1733; b. Quebec. He was very active in the Indian troubles of the time. In 1704 rescued some Iroquois from a band of Ottawas, who had taken them prisoners, contrary to treaty stipulation, and thus prevented a general war. In 1712 he was engaged in contests with the Fox Indians near Detroit, and about the same time founded the town which bears his name. In 1736 he had command of an expedition against the Chickasaws, was defeated, and with father Senat, D'Artagnette and others, was burned at the stake.

VINCENT, JOHN H., D.D., b. Alabama, 1832; educated at the Wesleyan institute; entered the ministry of the Methodist Episcopal church; was appointed by the general conference to the charge of the Sunday-school union and tract society, 1872; founded the *Sunday School Teacher* at Chicago. He is a well-known writer, speaker, and guide in the Sunday-school work.

VINCENT, WILLIAM, D.D., 1739-1815; b. London; educated at Cambridge; became fellow, 1761; ordained in the church of England; usher in Westminster school, 1762-71; head master, 1788-1802; rector of All-Hallows, London, 1778; prebendary at Westminster, 1801, dean of Westminster, 1802. He published *The Greek Verb Analyzed*; *Voyage of Nearchus from the Indus to the Euphrates*; *The Periphus of the Erythraean Sea*; *Defense of Public Education*. He contributed largely to the *Classical Journal* and *British Critic*.

VINCENTIAN CONGREGATION, so called from its founder, the Roman Catholic saint, Vincent de Paul, is an association of secular priests, who, although not in the strict sense a religious order, are bound by vows, and are especially devoted to the duty of preaching and hearing confessions among the people, particularly the poor. Another object of the Vincentian congregation is to undertake the direction of episcopal seminaries and other colleges for the education of ecclesiastics, as also to direct the annual devotional exercises of the secular clergy, called ecclesiastical retreat. See PAUL, VINCENT DE. At the latest recorded enumeration which has come under our notice, the congregation numbered above 700 members, in France, Italy, Poland, the Levant, and Algeria. The members are numerous also in America, and branches exist in Ireland and Scotland. The name Vincentian is sometimes given also to the sisterhoods (of which there are several, and of which that of charity is the most remarkable), which were founded by Vincent de Paul, and even to the charitable lay association, better known as the society of St. Vincent de Paul, which has extensive ramifications in almost all the countries in communion with the church of Rome, and which has been the occasion of certain recent restrictive measures in France. See BROTHERS AND SISTERS OF CHARITY; PAUL, VINCENT DE.

VINCENT, SAINT. See SAINT VINCENT, *ante*.

VINDELICIA, a province of the Roman empire, answering to portions of the modern Bavaria and Wurtemberg, bounded on the n. by the Danube, on the e. by the Rhens, on the s. by Rhetia, on the w. by the Helvetia. The Vindelici, who formed the main portion of its inhabitants, were so called from the Vindo and Licus. Their capital was Augusta Vindelicorum, now Augsburg.

VINDHYA MOUNTAINS. See INDIA.

VINE, a term sometimes used to designate any climbing plant, especially if shrubby, but also more particularly applied to the species of the genus *vitis*, of the natural order *vitaceæ*. This genus has *pentamerous* flowers (5-toothed calyx, 5 petals, 5 stamens), and has the petals united into a kind of hood and deciduous. The most important species is the **GRAPE VINE** (*V. vitifera*), from the fruit of which wine and raisins are made. The name grape is from the French *grappe*, a bunch of grapes; from the same root as *grape* or *grab*, to grasp.

The grape vine has large, angular, lobed, toothed, and more or less hairy leaves. The stems are numerous and branching, very long, and of rapid growth, with many tumid joints, the outer bark readily splitting and peeling off, the woody tissue abounding with vessels of large size, from which at the seasons of active vegetation, if the branch is wounded or cut across, the sap pours in prodigious quantity. The fruit-stalks, which are much branched, are opposite to the upper leaves, or in their stead are tendrils. The flowers are small, greenish white, and fragrant. The fruit is a round or oval berry, 2-celled and 4-seeded, varying much in size and color—in the small Corinth or currant grape, about $\frac{1}{4}$ of an inch in diameter; in the largest varieties, more than half an inch; green, yellow, red, purple, and sometimes variegated; but the color is entirely in the outer skin, the juice being always colorless; and while the pulp of the grape is wholesome, nutritious, and gently laxative, the skin is astringent and indigestible. Some of the ovules are often abortive, or even all of them in the fruit of old vines of some varieties, as in the seedless Ascaion or Sultan's raisins.

The vine attains a large size, the stem being sometimes 18 inches in diameter, so that the wood, which is very hard and durable, has been employed for making furniture, statues, etc. It attains also a very great age, continuing fruitful for at least three or four hundred years.

The grape is one of the most valuable of fruits, not only because of its use in the manufacture of wine, and as the source also from which brandy, vinegar and tartaric acid are obtained, but because, both in a fresh and dried state, it forms not a mere article of luxury, but a great part of the food of the inhabitants of some countries. Dried grapes, under the names of *raisins* and *currants*, are a considerable article of commerce. Fresh grapes are commonly eaten with bread in Syria, and some other countries in which they abound. The usefulness of the grape is increased by its keeping fresh for many weeks in a cool airy place. Some varieties are more easily kept than others. More than 1500 varieties are described in works on the culture of the grape; and this subject, under the name *ampelography* (Gr. *ampelos*, a vine), has been elevated by some recent German writers almost to the rank of a distinct branch of science. The quality of the grape is extremely liable to be affected by circumstances of soil and climate, and this is particularly to be observed in the wine produced from it, the difference between the produce of two vineyards in the same neighborhood being often very remarkable.

The vine dislikes a damp soil, but will thrive in almost any open soil with good drainage. In rich deep soils it grows luxuriantly, and produces abundance of large fruit; but on shallow, dry soils, the fruit, though less abundant, is of finer flavor. The vineyards most celebrated for the excellence of their wines are not generally of rich soil. The steep slopes of hills are often planted with the vine, and are sometimes terraced for this purpose; and nothing can be more suitable to situations where patches of good soil are mingled with bare rocks, nor anything more beautiful than the rocks covered with luxuriant foliage and rich fruit. This mode of cultivation on steep rocky slopes was anciently very prevalent in Judea.

It is doubted of what country the grape-vine is a native, nor is it known at what time, certainly very remote, its cultivation was first introduced into the s. of Europe. It is now found wild in some parts of Europe, but is rather naturalized than truly native. It seems probable that it is indigenous in the hilly countries on the s. of the Caspian sea, where it is very abundant and luxuriant, climbing to the tops of the loftiest trees, and producing large bunches of delicious fruit. But it is doubted if *vitis Indica*, a native of the n. of India, abounding in some parts of the Himalaya, is really a distinct species. The wild grapes of these mountains are round and purple, and very agreeable. It is doubted also by some if any of the wild grapes of America are really distinct; some of which, however, are much more different in their characters and qualities from the common form of the cultivated plant. Of these American grapes, the **FOX GRAPE** (*V. labrusca*) is the most similar to the cultivated grape. It is common throughout great part of North America, and is found as far n. as Quebec. The berries are large, deep blue, with thick skin and tough pulp, but make good wine, and have been found capable of much improvement by cultivation; their color also varying to red and white. The **CHICKEN GRAPE** (*V. astinialis*), not found n. of lat. 42°, has smaller and more agreeable berries, which are regularly brought to the Philadelphia market. Very similar to this is *V. sinuata*, a native of Virginia and Carolina, from the fruit of which good wine is made. The **BULLACE GRAPE** (*V. rotundifolia*), found only as far n. as lat. 39°, has larger grapes than any other American species, and of agreeable flavor. There is also a species (*V. cordifolia* or *vulpina*) with small nauseous berries, and one (*V. riparia*) found abundantly on gravelly banks of rivers in the western states, which has exquisitely fragrant flowers. But the habit and leaves of all these differ very little from those of the common vine. Nor does the **WATER WINE** of Jamaica, so called from the great quan-

ity of sap which its shoots pour out when cut (*V. Caribbea*), differ in very marked botanical characters; although its small black berries, which it produces in immense quantity, are acid and austere.

The cultivation of the grape and the making of wine are of the most remote antiquity, as appears from the Scripture history of Noah, and from many passages of the most ancient authors. The mythological fable of the marches of Bacchus relates to the extension of the culture of the vine from Asia into Europe. The earliest accounts we have of the manner of cultivating the vine are by the Roman authors Virgil and Columella. The vine was probably introduced into the s. of France as early as into Italy; it is said to have been brought to Marseilles by the Phœceans, about 600 B.C., and its cultivation was early co-extensive with civilization in all the countries near the Mediterranean. In Italy, so much of the land was occupied by vineyards, that the emperor Domitian, fearing a scarcity of corn, issued a restrictive or prohibitory edict 81 A.D., which was afterward long continued in force, through fear that the abundance of fine wine might tempt the barbarians of the n. to invade the country. The vine was introduced into the s. of Germany about the 3d c. B.C. Augustus preferred the Rhetian wine to all other. The first vineyards on the Rhine and Moselle were planted by the emperor Probus in 281 A.D. Under the Merovingians, the culture of the vine extended greatly both in France and Germany. Charlemagne derived a very considerable revenue from the vineyards even of the northern parts of his empire. The Huns who remained in a number of settlements on the Rhine, after the expedition of Attila into Gaul, 451 A.D., brought thither the arts of cultivating the grape, and of making wine, from Pannonia; and Hunnish grapes and Hunnish wine were long in particular repute. In the middle ages, the monks were the first to plant vineyards and to make wine in many parts of Europe.

The cultivation of the vine was introduced into England by the Romans. At the time of the Norman conquest, there seem to have been vineyards in the s. and s.w. of England, and, although they afterward disappeared, successful attempts were occasionally made to re-establish them; and one at Arundel castle in Sussex yielded, about the middle of last century, large quantities of wine. Of late years, the cultivation of the vine has much increased in the s. of England, in gardens, on the walls of suburban villas and of cottages, but chiefly for the sake of the fresh fruit, although wine of pretty good quality is also made in small quantities for domestic use.

The vine does not, in ordinary seasons, ripen its fruit well in Great Britain further n. than Yorkshire, although grapes have occasionally ripened in the open air in Scotland. It is, however, a hardy plant, in so far as the endurance of severe winter-frosts is concerned; but it requires for the ripening of its wood, as well as of its fruit, a considerable summer heat continued for several months. Thus, it does not succeed in parts of Britain in which the mean temperature of the year is higher than that of countries where good wine is made. A very moist climate is also unsuitable to it; and therefore it is not extensively cultivated in the n.w. of France, although there are many productive vineyards in the n.e. In the most northern regions to which its cultivation extends, the vine is protected in various ways during winter; in some places, by laying down its branches, and covering them with some depth of earth. It produces abundant fruit in warm climates, such as India, but the juice passes too rapidly into acetous fermentation to be used for making wine, although in many of the mountainous districts of India it might probably be cultivated for this purpose with success. Shiraz, in Persia, is one of the warmest climates celebrated for the production of good wine.

In Europe, the cultivation of the vine forms an important branch of rural economy as far n. as Coblenz on the Rhine; but in some countries, particularly in Greece and the Ionian islands, raisins form the chief part of the produce of the vineyards.

The cultivation of the vine was early introduced by the Spanish and Portuguese into the Azores, the Madeira and Canary isles, and America. The first vines were carried to the cape of Good Hope by the Dutch in 1650; but while the wines of Madeira and those of the limited district of Constantia at the cape of Good Hope have long enjoyed a high celebrity, and those of Canary and Teneriffe have been imported in considerable quantities into Europe, it is only of late that much attention has begun to be paid to the cultivation of the grape in the other parts of Cape Colony, or in any part of America. It is now, however, prosecuted with some energy in Ohio, Missouri, and some other states of North America, and very good wines are produced. It has also been introduced into Australia, where good wines are made, although not yet to a large extent.

The cultivation of the vine varies much in different countries. Success seems chiefly to depend on a good sunny exposure, liberal but not coarse manuring, and constant attention. New varieties are raised from seed, but the ordinary modes of propagation are by layers and cuttings. Fine varieties are sometimes budded or grafted on less valuable ones. In the vineries of Britain, the vines are carefully trained, in various ways, so as most completely to cover the walls and trellises, and to turn the whole available space to the utmost account; while superfluous shoots are displaced by pruning, so that the strength of the plant may be directed to the fruit-bearing branches, and that there may be no undue luxuriance of foliage to prevent sufficient access of light and air. The luxuriant growth of the plant renders the frequent application of the pruning-knife necessary during summer. The fruit being produced on shoots of the current year, the pruning is managed with a view to the abundance of these shoots, the greater part of which, when

they have served their purpose, are cut away, such only being left as are required for the extension of the space profitably occupied by the plant. The bunches of grapes are also generally thinned out with great care, in order that finer fruit may be produced. By such means, and the aid of artificial heat, grapes are produced equal to those of the most favored climates, and the vine attains to a large size and a great age. The famous vine at Hampton court has a stem more than a foot in circumference, one branch measuring 114 ft. in length, and has produced in one season 2,200 bunches of grapes, weighing on an average one pound each, or in all nearly a ton.

In the warmer countries in which the vine is cultivated, as in Italy, it is generally allowed to grow very freely, attaching itself to trees or espaliers; but in more northern regions it is commonly much pruned down, so that, instead of luxuriance and beauty, the vineyards exhibit a stiff and formal regularity. In some places, the vines are attached to poles; in others, they are pruned so close and kept so low as merely to form bushes which require no support. This mode of cultivation is sometimes adopted also in comparatively warm climates, as in some of the vineyards of the s. of France, and in those of Constantia, at the cape of Good Hope.

Only a few of the varieties of grape cultivated in Britain are at all suitable for the open air. By a judicious selection of varieties, as well as by variously regulating the application of heat, the grape season in vineries is greatly prolonged.

Grapes are sent to market in Britain in large quantities from the numerous vineries; they are also imported from Portugal, Spain, France, and Holland, generally packed in sawdust, but the close packing and the sawdust are injurious to their flavor.

Great ravages have been made of late years on vines in many countries by the *vine disease*, or *vine mildew* (*oidium Tuckeri*; see OIDIUM), and in France by the *phylloxera vastatrix* (q. v.).

The juice of ripe grapes contains a considerable quantity of *grape-sugar* (see SUGAR), small quantities of a glutinous substance, and of extractive bitartrate of potash, tartrate of lime, a little malic acid, and other ingredients, suspended or dissolved in water. The rapidity with which it passes into a state of fermentation after being expressed from the fruit is remarkable.

For the making of wine, the wine-trade, the qualities and uses of wines, the different kinds of wine, etc., see WINE. Concerning the other commercial products of the grape, see BRANDY, VINEGAR, TARTARIC ACID, RAISINS, and CURRANTS.

VINE (ante). The first attempt at the culture of the vine in the United States for wine-making was in Florida, in 1564; and another was made by the British colonists in Virginia, in 1620. Early in the 18th c. certain vineyards in the latter state produced as much as 750 gallons of wine per annum; and in Delaware, wine was made from native grapes as early as 1648. In 1664 the governor of New York granted to one Saul Richards the privilege of making and selling wine, free of duty. In 1683 William Penn engaged in the cultivation of the vine, near Philadelphia, but with only partial success. In 1790 a Swiss colony made unsuccessful attempts to establish vineyards in Jessamine co., Ky.; and afterward removed to Vevay, Ind., where they met with better fortune. In Illinois, 110 hogsheads of wine were made from native grapes in 1796; and, near the end of the last century, wine was made in Pennsylvania from the Schuylkill Muscatel grape, which was the same employed in Indiana. In 1825 the Catawba vine, a native of North Carolina, came into prominence; and it was afterward cultivated extensively near Cincinnati by Nicholas Longworth, who may be called the father of this culture in the United States. In 1858 the vineyards near Cincinnati covered 1209 acres, yielding an annual supply of 240,000 gallons. At present these vineyards cover in the neighborhood of 2,500 acres. In 1855 the entire production of Catawba wine in Ohio amounted to 400,000 gallons. In the states e. of the Rocky mountains, the greatest extent of territory in vineyards occurs in Ohio, New York, Missouri, Illinois, Pennsylvania, Iowa, and Kansas; but at present they exist in nearly every state in the union. The grapes most extensively grown are the Catawba, Delaware, Cunningham, Isabella, Iona, Concord, Norton's Virginia, Arkansas, Devereaux, and Clinton. Of all the states, California is the most important for vine-growing. Vineyards were first cultivated there during the middle of the last century, the first grape planted being the Los Angeles, which was the only one grown until 1820. One vineyard—that of the Buena Vista company, in the Sonoma valley—is 450 acres in extent, and grows more than 300,000 vines. Of the varieties of grape in use in the United States, the Concord, Catawba, Delaware, and Norton's Virginia, are the most popular. The Concord proves reliable in almost all locations and soils; the Delaware and Catawba must have special locations and soils; while Norton's Virginia is only planted for wine use. The Croton grape and the Benasqua originated with Stephen Underhill of Croton Point, N. Y., who also brought the Isabella to great perfection; and these two grapes almost rival the best foreign varieties. In 1878 there were 200,000 acres of land given over to grape-culture in the United States, and the grape crop amounted in value to \$2,118,900, the wine product being 15,000,000 gallons. In the United States there are several distinct native species of grape, from which have been originated a vast number of varieties now under cultivation. Great attention has been paid to this industry, but its success has been materially lessened by the tendency of the plant to rot and mildew, especially in damp soil, and where heavy dews prevail.

VINEGAR is that form of **ACETIC ACID** (q.v.) which is generally preferred for culinary purposes, and which is made by the fermentation of vegetable substances. In Great Britain, it is manufactured on a large scale by the fermentation of malt; on the continent of Europe, it is as largely made from low wines which have turned sour Malt, or British vinegar, as it is sometimes called, is made by brewing a weak wort from malt exactly as for beer (q.v.). To 100 gallons of this, at a temperature of 70°, are added 4 gallons of yeast, and well stirred through for 8 or 10 minutes. This mixture is then allowed to ferment actively for two days, and is then transferred to the stoving-room; here it is distributed into a number of tubs, which, when filled, are covered over with a coarse canvas. This room is dark, and is heated by stoves, and the heat is constantly sustained for weeks until the conversion of the wort into vinegar is complete. The process of acetification is accelerated by introducing into the casks with the wort either the residuary fruit used in making domestic wine, or the foot stalks and skins of grapes. This *rape*, as it is called, acts as a kind of ferment. Other processes are used by different manufacturers for the purpose of producing it quicker; but the minute descriptions necessary to render them clear would be out of place here. Much vinegar is also made of beer which has become sour; it is, however, very inferior in quality, and wants the agreeable flavor of malt vinegar prepared by the above process, which is due to the presence of acetic and other ethers.

A rather insipid kind of vinegar is made by means of the vinegar-plant (q.v.). The vinegar-plant itself may be produced thus: A solution of a quarter of a pound of sugar and half a pound of treacle in three quarts of water is first simmered, then poured into a jar, covered up, and kept in a warm place for six weeks. The liquid becomes vinegar, and on the top there has been formed a scum-like fungus, which is the vinegar-plant; and by adding a piece of this to a similar solution, the process of conversion into vinegar now takes place in much less time. During the process, the plant thickens by the formation of a new layer on its under surface; and by peeling off this layer, and using it in a fresh operation, the plant may be propagated indefinitely.

The greatest manufacture of *wine vinegar* in Europe is at Orleans, in France. Here the wines are sent from all parts when unfit for drinking, and are converted into vinegar. In the manufacture a large number of casks are used, with openings into each of only two inches diameter. Into each one are poured 100 pints of vinegar boiling hot; and to this, after eight days, are added 10 pints of sour wine, and this is repeated every 8 days until the cask is full; another 15 days completes the process, and the vinegar is ready for use. Beech-shavings are much used in vinegar-making, as they are found to assist in clarifying the liquor by attracting the lees, which settle upon them, and leave the liquor clear, in which state it acetifies more rapidly.

“According to Ure, a good vinegar may be prepared by adding to each gallon of a syrup composed of 1½ lb. of sugar and 1 gal. of water, a quarter of a pint of yeast. If kept for three days at a temperature of 75° or 80°, it will be sufficiently acidified to allow of being drawn off into the refining-cask, where one ounce of bruised raisins and one ounce of crude tartar are to be added to each gallon of liquor. When the sweet taste has quite disappeared it should be drawn off into bottles, and corked down tightly. It is stated that such vinegar will contain 5 per cent of pure acetic acid.”—Miller’s *Organic Chemistry*, 2d ed. p. 339. Vinegar prepared by these methods contains a large amount of foreign matters, which can be got rid of by simple distillation; the acid liquid which comes over constituting what is known in pharmacy as *distilled vinegar*. What is sold commercially as distilled vinegar is simply acetic acid distilled from wood (See **PYROLIGNEOUS ACID**), and diluted with five times its volume of water. This constitutes also the vinegar used by pickle manufacturers; it is quite as wholesome as common vinegar, but wants its agreeable flavor; its preservative powers are, however, much greater, and its price very much less, if fairly charged. Vinegar containing five per cent of the pure acid is the strongest that is ever produced, and is termed *proof vinegar*. There are four kinds manufactured, which are known in trade by the numbers 18, 20, 22, and 24, the last being the best quality. The strength of any specimen is best ascertained by determining the quantity of anhydrous carbonate of soda which a given weight of it will neutralize, it being recollected that 100 grains of carbonate of soda correspond to 96.2 grains of anhydrous acid. The ammonia test, according to Neligan, serves to distinguish French from English vinegar: with the former, the color is purplish; with the latter, there is either no change, or it is brownish. There is generally a slight turbidity, which is due to a trace of lime.

As a condiment, vinegar is an ingredient of a large number of sauces, and of all ketchups and pickles; and although it cannot be regarded as an essential article of food, its applications in cookery are numberless. Young ladies, with an undue tendency to corpulency, sometimes drink vinegar freely with the view of improving the figure; but as vinegar only causes thinness by injuring the digestion, it is obviously not worth while that they should run the risk of exchanging slight fullness of habit for chronic dyspepsia.

Vinegar is used in medicine as a cooling-astringent, and may be employed with much benefit if taken freely, when largely diluted with water, in hemoptysis, in hematemesis, and in the colliquative sweating of hectic fever. Dr. Neligan states that in severe hicough, he has often seen benefit derived from a dose of a wine-glassful of vinegar. In cases of poisoning with the alkalis or their carbonates, it is one of the best antidotes.

It may also be employed locally in various ways—as, for example, to check hemorrhage from the nose, womb, etc. In intestinal hemorrhage, an enema containing vinegar and cold water may be used with success, especially if the lower part of the intestine be the seat of the bleeding. Sponged in a diluted state (one part to three of cold or tepid water) over the neck, chest, etc., it affords great comfort and considerable relief in cases of colliquative sweating. In its character of a refrigerant rather than as an astringent, its local action on the skin is attended with much benefit in the treatment of most febrile and inflammatory diseases; it should be freely applied, as in colliquative sweats, to the surface of the body, face, and extremities; and thus employed, has a very tranquillizing effect, and often induces sleep. The heat and pain commonly experienced in sprains are often relieved by the local application of brown paper soaked in diluted vinegar, and changed when the feeling of heat returns. It is an important addition to astringent gargles in cases of relaxed uvula and tonsils; and is the best application to the eyes in cases in which lime has got within the eyelids. The ordinary dose is from 2 to 4 drams; and when taken as a drink, 3 ounces may be mixed with a pint and a half of water, and taken in the course of the day.

The term *Chili vinegar* is applied to a preparation obtained by infusing half an ounce of cayenne pepper in a quart of French vinegar for ten days, and straining. It is commonly added to gargles in the proportion of 1 ounce to 8 or 9 ounces of infusion of roses, in cases of relaxed sore throat.

Aromatic Vinegar, known also as *Vinegar of the Four Thieves*, *Marseille Vinegar*, and *Camphorated Vinegar*, and *Camphorated Acetic Acid*, consists of strong acetic acid, holding in solution camphor and the oils of cloves, lavender, rosemary, and lemons. It is very fragrant and volatile, and must be kept in well-stoppered bottles. It was formerly regarded as a valuable prophylactic of all infectious diseases, but is now only used as an external stimulant, the vapor being applied by a smelling-bottle to the nostrils in cases of fainting.

VINEGAR-PLANT. *Penicillium glaucum*, a fungus of the sub-order *hyphomycetes*, but somewhat resembling those known by the name of MOLD (q.v.). It forms a flocculent mass or web, which is tough and crust-like or leathery, and when examined by the microscope, is seen to consist of a *mycelium* of branched threads, with the branches somewhat tangled, and the spores disposed in patches about the pencil-shaped ends of fertile threads. It is found on decaying bodies and in fluids undergoing the acetous fermentation which it greatly promotes, and which, indeed, it very readily occasions, a small piece placed in sugar and water soon changing it into vinegar. Advantage is sometimes taken of this property for making vinegar.

VINELAND. a village in Cumberland co., N. J., on the West Jersey and New Jersey Southern railroads, 34 m. s. of Philadelphia, 115 from New York; pop. '75, 2,300. It is regularly laid out on a plot 1 m. square. The principal avenues are 100 ft. wide; the other avenues and streets 60 ft.; and are bordered with shade trees. The houses are surrounded by vineyards, orchards, and flower gardens. The tract in which is the village covers an area of 48 sq. miles. It was purchased in 1861 by Charles K. Landis, and is divided into fruit farms of 5 to 25 acres. It lies chiefly in the township of Landis, Cumberland co., but extends to Buena Vista, Atlantic co., and Franklin, Gloucester county. The town contains 12 churches, 18 district schools, a high school, several private schools, a kindergarten, a bank, several factories, lumber yards, steam flour mills, machine shops, 2 daily, 4 weekly newspapers, 2 monthly periodicals, 2 hotels, a large post-office, and a hall capable of seating 1000 persons. Besides the post-office at Vineland, there are post-offices at Forest Grove, Landisville, North Vineland, South Vineland. The chief business is fruit-raising. The sale of intoxicating liquor is prohibited by the people. The climate here is singularly mild in the winter, and favorable for invalids.

VINER, CHARLES, 1680–1756; b. England. His work entitled *A General and Complete Abridgment of Law and Equity*, in 24 vols., 1741–51, was the first work of its character printed, and according to Blackstone was the work of fifty years. He established a professorship of common law at Oxford, leaving a bequest of £12,000 to sustain it. Blackstone was the first incumbent of this professorship.

VINES, RICHARD, about 1580–1640; b. England. In 1614, or about that time, he established a settlement at Saco Bay, Me., acting as the agent of sir Ferdinand Gorges. In the pestilence of the winter of 1616–17, his medical skill was of great aid to the Indians. In 1617 he ascended the Saco river as far as Crawford's Notch. The village of Biddeford was founded on land granted to Vines by the Plymouth company in 1630.

VINES, RICHARD, about 1590–1655; b. England; educated at Magdalen college, Cambridge: was rector of Waddington, Warwickshire; minister of St. Clement Dane's; and vicar of St. Lawrence Jewry, London. He was a member of the Westminster assembly of divines, 1643–49; master of Pembroke hall, Cambridge, 1645; resigned, 1650. He published *Sermons* (1644). Among those writings which appeared after his death were *Thirty-two Sermons on John vi. 44* (1662).

VINET, ALEXANDRE-RODOLPHE, Swiss divine and author, was b. at Lausanne, June 17, 1797, and received his education in his native city as a student of the Protestant church, of which he was ordained a minister in 1819. From an early age he showed a

passionate fondness for the study of French literature, which he cultivated with so much success that at the age of 20 he was appointed professor of French language and literature in the gymnasium of Basel. This position he held till 1837, when he removed to Lausanne to fill the chair of practical theology in the academy of that city, which chair, however, he resigned in 1840, when he seceded from the national church, on account of the new constitution imposed upon it in that year. Notwithstanding his resignation, he appears to have continued his lectures either in the academy or privately; and in 1844 again connected himself with that institution as substitute-professor of French literature. Vinet took a leading part in the formation of a constitution for the Free church of Vaud, formed by those who seceded from the national church in 1845, this secession having been in a great measure the result of the influence of his own writings and teachings in favor of the separation of church and state. He died May 18, 1847. Vinet was an eloquent and earnest preacher, clear and brilliant rather than profound in thought; and although highly evangelical and orthodox, advocated the utmost liberty and toleration of opinion and practice in matters of religion. He wrote largely both on literature and religion, and most of his works have been translated into English. His works on French literature show that he was thoroughly acquainted with its history, and possessed the critical faculty in no mean degree; as a philosophico-religious writer, he is very popular among the educated religious public both in England and America. His principal works are: *Chrestomathie Française* (3 vols. 1829); *Histoire de la Littérature Française au XVIII. Siècle; Etudes sur la Littérature Française du XIX. Siècle* (3 vols.); *Mémoire en Faveur de la Liberté des Cultes* (1826); *Discours sur quelques Sujets Religieux* (1831); and *Nouveaux Discours*, etc. (1841)—from which two last-mentioned works selections have been translated into English, and published under the title of *Vital Christianity; Etudes sur Blaise Pascal, Etudes Evangéliques*, and *Nouvelles Etudes Evangéliques*, which have been rendered into English as *Gospel Studies*; etc.

VINEYARD SOUND, a passage 20 m. long and 6 m. wide between the Elizabeth islands, off the s.e. coast of Massachusetts and the island of Martha's Vineyard; the customary course for vessels sailing from Boston to southern ports.

VINIC ACIDS, an important group of acids, whose mode of formation may be thus described: When a mixture of concentrated sulphuric acid with any of the alcohols is heated to about 212°, chemical action takes place, and the result is the formation of a new coupled or conjugated acid, in which the elements of one molecule of the alcohol and one of sulphuric acid (taken, according to recent views, as S_2O_6) are present. In these compounds, the existence of sulphuric acid can no longer be detected by the addition of baryta; the new acids forming soluble baryta-salts. As examples of these acids may be mentioned sulpho-methylic acid, HO, C_2H_5O, S_2O_6 , and sulpho-ethylic acid, HO, C_4H_9O, S_2O_6 , which has been already described under its old name of *sulphovinic acid*.

VINLAND—i.e., WINELAND—the name given to the chief settlement of the early Norwegians in North America. It is undoubtedly represented in modern times by part of Massachusetts and Rhode Island. The first that saw it was Bjarne Herjulfson, who was driven thither by a storm in the summer of 986 A.D., when making a voyage from Iceland to Greenland, of which country his father, Herjulf, and Eric the Red were the earliest colonists. But Bjarne did not touch the land, which was first visited by Leif the Lucky, a son of Eric the Red, about 1000 A.D. The latter built a number of wooden houses, which were called *Leifshúfir* (Leif's bothies?). A German of the name of Tyrker, who accompanied him, noticed the grape growing there, as in his native country, and hence Leif called the region "Vinland." Two years after, Leif's brother, Thorwald, arrived, and in the summer of 1003 led an expedition along the coast of New England, southward, but was killed the year following in an encounter with the natives. The most famous of the Norwegian explorers, however, was Thorfinn Karlsefne, an Icelander, who had married Gudrid, widow of Thorstein, a son of Eric the Red, and who in 1007, sailed from Greenland to Vinland with a crew of 160 men, where he remained for three years, and then returned, after which no further attempts at colonization were made. Rafn (q.v.), in his *Antiquitates Americanae*, has published the most complete collection of the evidence which proves the pre-Columbian colonization of America. See *Wilhelm's Island, Heitramannaland, Grönland und Vinland* (Heidelberg, 1842). Both Rafn and Finn Magnúsen are excessively anxious to show that Columbus derived his first hints of a new world from the accounts of these old Icelandic expeditions. Their *amor patriæ* perhaps leads them too far; but, on the other hand, it is well to bear in mind that Finn Magnúsen, in one of the early numbers of the *Nordisk Tidsskrift for Oldkyndighed* has conclusively established the fact that Columbus did visit Iceland in 1477, 15 years before he undertook his great expedition across the Atlantic; and it is not at all improbable that he may have heard, while there, something of the long-abandoned Vinland, and so had his adventurous thoughts first turned in that direction.

VINNITZA, a t. of west Russia, in the province of Podolia, stands on both banks of the Bug, 100 m. e.n.e. of Kaminetz. It was founded in the 14th c., and has suffered much from the invasions of Tartars and the Cossacks. There are very few factories,

and the trade, which is not extensive, is carried on exclusively by the Jews. Pop. '67, 10,694.

VINTON, A co. in s. Ohio, drained by the head-waters of the Scioto river and Racoon creek; 400 sq.m.; pop. '80, 17,226—16,593 of American birth. Co. seat, McArthur.

VINTON, ALEXANDER HAMILTON, D.D., 1807-81; b. Providence, R. I.; studied at Brown university; graduated at the Yale medical school, 1828; practiced medicine, 1828-32; studied theology at the General Episcopal seminary, New York; ordained, 1835; pastor of a church, Portland, Me., 1835-36; at Providence, R. I., 1836-42; at Boston, 1842-58; rector of Holy Trinity, Philadelphia, 1858-61; rector of St. Mark's church, New York, 1861-70; rector of Emanuel church, Boston, 1870; professor in the Protestant Episcopal divinity school, Cambridge, Mass. Dr. Vinton was an eloquent pulpit orator, a ripe scholar, and a faithful minister.

VINTON, DAVID H., 1803-73; b. R. I.; graduated at West Point, 1822; entered 4th artillery; was sent to Florida, 1836; quartermaster-general of Florida, 1837-46; chief quartermaster on the staff of gen. Wool in Mexico, with rank of major, 1846; chief quartermaster in department of the west, 1852-56; of Texas, 1857-61; taken prisoner when Twiggs surrendered; exchanged, and became chief quartermaster, New York; made colonel, 1864; assistant quartermaster-general, 1866; placed on retired list the same year; was brevetted colonel and brigadier-general for faithful service.

VINTON, FRANCIS, D.D., 1809-72; b. R. I.; graduated West Point, 1830; second lieutenant 3d artillery; stationed at fort Independence, Boston; studied law at Harvard law school; civil engineer on several New England railroads two or three years; admitted to the bar, 1834; studied theology at the Episcopal theological seminary, New York, 1836; ordained 1838; rector at Providence and Newport, 1840-44; Grace church, Brooklyn, N. Y., 1844-55; assistant minister of Trinity church, New York, 1855; prof. of ecclesiastical law and polity in the General theological seminary, 1869. He published *Arthur Tremaine, or Cadet Life; Manual Commentary on the General Canon Law of the Protestant Episcopal Church in the United States*.

VINTON, FRANCIS LAURENS, b. Maine, 1835; graduated West Point, 1856; entered the cavalry, but resigned, to devote himself to metallurgy; became pupil of the Imperial school of mines at Paris, graduating with distinction; appointed capt. of the 16th U. S. infantry, 1861; col. 43d regiment of N. Y. volunteers; fought in Hancock's brigade through the peninsular campaign; made brig.gen. of volunteers, Mar. 1, 1863; wounded at Fredericksburg; professor of mining engineering, Columbia college, 1864.

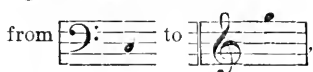
VINTON, JUSTUS HATCH, 1803-58; b. Conn.; educated at Hamilton institution, (now Madison university); sailed as missionary of the American Baptist missionary union for Burmah in 1834; was stationed among the Karens at Chummerah, 90 m. from Moulmein; visited the United States in 1851, and returning took charge of the Karen theological seminary at Moulmein, but removed the following year to Rangoon, continuing his labors among the Karens.

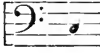
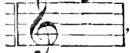
VIOL (Mid. Lat. *vitula*; Ital. *viola*, derivation uncertain), a musical instrument played with a bow, no longer in use, which was the immediate precursor of the violin. It is to be seen represented on monuments as far back as the close of the 11th century. The belly and back were flat; there were larger bends in the sides than in the violin; and frets, like those of the guitar, were placed on the neck of the instrument, to show where the fingers of the left hand should be put to produce the desired notes. There was great variety in the number of strings: in Germany, 3, 4, and 5 were all common; in Italy, there were usually six. The strings were tuned by fourths and thirds. There were 4 sizes of viol in use for treble, alto, tenor, and bass respectively, and they were often played together in concerted music. The smaller viols were called *viol da braccio*, from being held with the arm; the larger, *viol da gamba*, from being placed between the legs. The treble viol was rather larger than the modern violin. The viol da gamba, or bass viol, held its place longer than the smaller viols, but was eventually superseded by the violoncello.

VIOLA, ALTO VIOLA, or TENOR VIOLIN, a larger description of violin, to which the part between the second violin and bass is generally assigned. It has 4 gut strings, the two lower covered with silvered copper wire. They are tuned by fifths, thus,



exactly an octave above the violoncello. The compass is



from  to , or higher, and the music is generally written on the

alto clef.

VIOLA D'AMORE, an obsolete instrument of the viol tribe, revived a few years ago with some success by M. Urhan at Paris. It had 5 or 7 strings of catgut, which were placed and played as in other bow-instruments; but below them, and passing underneath

the bridge, were 5 or 7 other strings of metal tuned in unison with them, which vibrated sympathetically when the former were played; giving to the music a mysterious resonant character. The compass was at least three octaves and a half. The strings of M. Urhan's viola d'amore were tuned in thirds and fourths, thus:



VIOLACEÆ, a natural order of exogenous plants, of which about 300 species are known, natives both of temperate and tropical countries, those belonging to the former being generally herbaceous, and those belonging to the latter generally shrubby. They have simple leaves with persistent stipules. The calyx consists of five persistent sepals, usually elongated at the base; the corolla of five hypogynous petals, unequal in the sub-order *violæ*, and equal in the sub-order *alsodæ*. There are five stamens inserted in a hypogynous disk; the filaments prolonged beyond the anthers. The ovary is one-celled, generally with many ovules, the style single, with an oblique stigma. The fruit is a three-valved capsule, with many seeds. The best known species are the violets (q.v.), noted for their beauty and fragrance. Emetic and purgative properties prevail in the order, and some of the South American species, particularly of the genus *ionidium*, yield valuable medicines. See **IPPECACUANNA** and **CRUCIFERULLI**. Yet the leaves of the lobolobo (*conohoria* or *alsodæia lobolobo*) are used in Brazil as spinach.


VIOLENT PROFITS, in the law of Scotland, mean the income or rent enjoyed by one who forcibly or unwarrantably detains land to which he has no title. Such profits are held to be the full profits which the landlord could have made either by possessing the lands himself or by letting them.

VIOLET (*Violetta*), a genus of herbaceous plants, mostly perennial, of the natural order *violaceæ*. They have a short stem, or are stemless, having in the latter case a short root-stock (rhizome); the leaves are alternate, and have long stalks; the flowers have five petals, different in form and size, the lowest having a spur behind. Nearly 200 species have been described, natives chiefly of northern temperate countries. Several species are much cultivated in gardens, some as *V. tricolor*, on account of their beautiful flowers; others, as *V. odorata*, on account of their fragrance. *V. tricolor*, the PANSY, PANSY VIOLET, HEART'S EASE, is very abundant in fields, meadows, woods, etc., in Britain and in most parts of Europe, and the n. of Asia; it is also found in North America, although it has probably been introduced there from the old world. It is a very variable plant, its flowers differing much in size and color, but is readily distinguished by its large lyrate pinnatifid stipules. The stem is somewhat triangular, branching, and diffused. In some of its most common forms, this plant is a more despised weed, with small flowers; other wild forms have much larger flowers; and to it are referred the large and beautiful garden pansies, the varieties of which are innumerable. The pansy (Fr. *pensée*), probably from the drooping attitude of the flower, suggestive of thoughtfulness) is one of the finest of florists' flowers, and no flower has been more improved by cultivation. Another species has of late years been introduced into cultivation, *V. alatica*, a native of Siberia, and by itself, or by hybridization with *V. tricolor*, has become the parent of many garden pansies. In a wild state, it has oval leaves, and large yellow or purple flowers. The finest garden pansies are not preserved or propagated without great difficulty, and require most careful cultivation, without which they quickly relapse to their wild forms. Florists demand that a pansy shall have a round, flat, and very smooth edge, the petals thick and velvety, the three lower petals alike in their ground color, the lines or pencilings in the center bright and distinct, the two upper petals—which always differ in color from the others—perfectly uniform, the flower measuring at least an inch and a half across.—The SWEET-SCENTED VIOLET (*V. odorata*) is common in grassy places in England, and throughout Europe and the n. of Asia. The flowers are either of a deep blue color or more rarely white. Several other species, with pale blue flowers, and destitute of smell, are common in meadows and woody glades in Britain and other parts of Europe.—The DOG VIOLET (*V. canina*) is one of the most common ornaments of hedgebanks.—North America has a number of species, one of which, *V. blanda*, is sweet-scented. The Himalayas produce a number of species very similar to those of Europe. The roots of several species of violet were formerly used in medicine. They contain a bitter alkaloid, *violine*, which acts as an emetic and purgative. The petals of the sweet-scented violet are used for the preparation of *juice* or *syrup of violets*, which is used as a gentle purgative for children, and also as a chemical test, being reddened by acids, and rendered green by alkalis. The bruised leaves of *V. tricolor* are sometimes used as a remedy for ringworm.—The DOG'S TOOTH VIOLET (*erythronium dens canis*) has no connection with this genus, but is a very beautiful flower of the natural order *liliaceæ*.

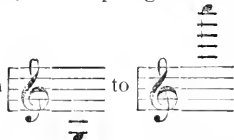
VIOLET STONES, the name given to certain stones found upon high mountains, as in Thuringia, upon the Harz mountains and the Riesengebirge, which, in consequence of being covered with what is called *violet moss*, emit a smell like that of violets. They retain this smell for a long time, and it is increased by moistening them.—The VIOLET MOSS (*hyssus violifolius*), which some botanists have been inclined to rank with lichens, and others with fungi, consists of simple articulated threads, and spreads over the stones in

the form of a delicate incrustation, which at first is reddish brown, but in a more advanced stage, yellowish green. It was formerly in use as a popular remedy for feverish cutaneous eruptions.

VIOLIN (diminutive from *viola*), a stringed musical instrument played with the bow. Like other bow-instruments now in use, it consists of a wooden sonorous chest, formed of two slightly arched surfaces, known as the back and belly, united by sides or ribs, and with a curve or hollow on each side in the middle of the length—a neck or finger-board attached to the chest, and strings, fastened at one end to the belly by a tailpiece or projection of wood, and at the other to the head or extremity of the neck, where they can be tightened or loosened at pleasure by turning-pins. The strings thus passing over the belly are raised up from it by a bridge; and on the belly there are two sound holes opposite each other, of a form resembling the letter *f*, or rather the long *f*. The sounds are produced by drawing a bow across the strings, the upper surface of the bridge being convexly curved, so as to enable the bow to be drawn along each string separately, without coming in contact with the rest. The modern violin has 4 strings of gut, the lowest covered with fine silvered copper wire, or sometimes, in the best instruments, with silver

or even gold wire. These strings are tuned in fifths, thus,  and

the highest string is called the first. The bow is held in the right hand, and the different sounds of each string are obtained by stopping, i.e., pressing it with the finger against the fingerboard at certain distances thus shortening the vibrating portion, and raising the pitch of the sound. Very high notes are produced by the harmonics (q.v.) of the string, which, instead of being pressed against the fingerboard, is touched lightly, the sound resulting from the vibration being, not as in ordinary cases, of the part of the string between the point of stopping and the bridge, but of a harmonic section of it. A peculiar modification of tone is produced by the application of the *mute*, or *sordino*, a little wooden instrument placed on the bridge. A violin or other bow-instrument may occasionally be played *pizzicato*, i.e., with the fingers, as a harp or guitar. The compass

of the violin is about three octaves and a half, from  with all the

intermediate semitones; but the highest notes are apt to be harsh and squeaking. Though chiefly an instrument of melody, it is to a limited extent capable of harmony by double stops—chords of two notes may be struck together, and three or four notes may be played in arpeggio. Few instruments can compare with the violin in power of expression and execution. It has an unlimited command over a very wide range of sounds, to which any degree of piano and forte, of staccato and legato, can be imparted. In orchestral music, there are always two different violin parts for treble and alto, known as first and second violin; and the same is generally the case when the violin is used in concerted music, the usual arrangement of stringed quartett music being for two violins, viola, and violoncello.

Recent writers trace the origin of the violin to the Indian *ravanastron*, yet played by the poor Buddhist monks who go begging from door to door, and traditionally believed to have been the invention of Ravana, king of Ceylon, 5,000 B.C. From the ravanastron sprang the *goudok* of Russia, and the *crwth* of Wales—the latter in use before the 6th c.—both of which seem to have differed from later instruments of the same tribe in having the upper surface of the bridge flat, so that all the strings had inevitably to be sounded at once. The viol (q.v.) was the more immediate precursor of the violin and of its relatives of deeper pitch, the violoncello and double bass. The earliest violins seem to have been those of Gasparo di Salo in Lombardy, 1560–1610. During the 17th c., the family of the Amati at Cremona, including Andrew, his sons Jerome and Antonio, and Nicolo, son to Jerome, produced violins, the wonder of succeeding times, whose tone and quality more recent makers have in vain sought to equal. Antonio Stradivari, also of Cremona, pupil of Nicolo, if possible surpassed the Amati, and for a time the repute of Cremona was kept up by the families or the Guarneri and Ruggieri. Next to the Cremonese violins, in the estimation of connoisseurs, stand those of the Tyrolese makers, Jacob Stainer, and Matthias Klotz and his sons. Experience has shown that the minutest details of form and proportion, and the material of which each separate part is made, are matters of vital importance to the quality of the violin. The great makers seem by a succession of delicate experiments and observations to have attained to acoustical qualities of high perfection, which their careful workmanship and extreme dexterity enabled them in all cases unfailingly to reproduce.—See Otto's *Treatise on the Structure and Preservation of the Violin*; Sandys and Forster, *History of the Violin*; Fétis, *Notice of Antonio Stradivari, with Researches on the Origin and Transformations of Bow-instruments*; Hart, *The Violin* (1875).

VIOLLET-LE-DUC, EUGÈNE EMMANUEL, b. Paris, 1814; studied architecture, and became proficient in designs of the Gothic style. His reputation in his profession is very high, and he is especially skilled in the restoration of churches. Perhaps his best work in this direction is the restoration of Sainte Chapelle. The changes in Notre Dame, Paris, were the joint work of M. Viollet-le-Duc and M. Lassus. He is a grand officer of the Legion of honor and an honorary member of the Royal academy, London. He has written several books on architecture, which have been translated into English, and a *Memoire sur la Défense de Paris* (1871).

VIOLONCELLO (diminutive from Ital. *violone*, large viol or double-bass), a large instrument of the violin class, held by the performer between his knees. It has four gut strings, the lowest of them covered silvered copper wire, and is tuned thus,

in fifths: Its compass extends from to

Its signature is usually the bass clef, the tenor or treble clef being used for the higher notes.

VIOMÉNIL, ANTOINE CHARLES DU HOUX, Vicomte de, 1728-1827; b. France, entered the army in which he attained the rank of field marshal. He assisted the Polish confederation against Russia in 1770. Coming to America in 1780 as Rochambeau's second in command, he gained distinction at the siege of Yorktown, and was soon made lieutenant. After his return to France, he became governor of La Rochelle. He died from wounds received in defending Louis XVI. in the assault upon the Tuileries.

VIOTTI, GIOVANNI BATTISTA, an eminent violin-player; b. at Fontanetto in Piedmont, in 1753, and chiefly educated under Pugnani at Turin. After holding for a short time the appointment of first violinist in the royal chapel at Turin, he relinquished that office, in order to travel in Europe with Pugnani. In Berlin, St. Petersburg, Paris, and London, his playing created a *furor*. He first visited London in 1792, and was engaged there at Salomon's concerts, and for a time as leader of the orchestra in the king's theater. A groundless charge raised against him of being a revolutionary agent drove him from England; but after living for a time in retirement at Hamburg, he returned to London, entered into speculations which ruined his fortunes, and died there in 1824. His compositions include violin concerts and quartets for violin, tenor, and violoncello, violin duets and solos, and a few piano-forte compositions. His playing was characterized by a vigor of style and purity, as well as brilliancy and elegance, previously unknown; and he has been considered the father of the modern violin school.

VIPER, *Vipera*, a genus of serpents of the family *viperidæ* (q.v.), having the head depressed, oblong-ovate, somewhat compressed before, and wider behind the eyes; the head covered with shields, the tail with two rows of plates beneath. Some naturalists divide the genus into two: *vipera*, having one rather large shield in front of the head, the rest of the head covered with small shields, and the muzzle more or less recurved; and *pelias*, having three shields on the head larger than the rest, the nose blunt. To the latter section belongs the common viper or adder (*V. communis*, or *Pelias berus*), which is found throughout Europe from the n. of Russia to the Mediterranean, and occurs in most parts of England and Scotland. It is not found in Ireland. It seldom attains a length of more than two feet. The head is depressed, and almost oval, slightly widening behind the eyes; the gape as long as the head. Although there are no teeth, except the poison-fangs, in the upper maxillary bones, there is a row of small teeth in the palatine bone on each side. The neck is rather smaller than the back of the head. From the neck, the thickness increases to near the middle of the entire length, and then diminishes to the vent. The tail tapers more rapidly, and ends in a point. The tail varies in the proportion of its length to that of the body, but is generally not more than one-third of the entire length. The smaller shields of the head are in some specimens very symmetrically placed, but irregularly in others. The ground color varies considerably, being in general nearly olive, rich deep brown, or dirty brownish yellow. A mark between and rather behind the eyes, a spot on each side of the hinder part of the head, a row of confluent rhomboidal spots running along the upper surface, the whole length of the body and tail, and a row of small irregular triangular spots on each side, are much darker than the ground color, often almost black; and in all varieties of color these markings appear. The under parts are of a lead color. Vipers are sometimes found of color very different from the ordinary kind, which some naturalists have too hastily described as distinct species. Thus, in some parts of England, a *black viper* is occasionally met with, the ground color of which is a rich black; the characteristic markings visible in particular lights, of a more intense black than the rest. A *blue-bellied viper* has also been described, but differs little from the ordinary kind. A variety also occurs with the ground color dirty white, the markings jet black. The *red viper* has the ground color brick-red, the markings rusty brown. It differs, however, from the ordinary kind in other particulars. There are some slight peculiarities in the markings, and the head is broader behind the eyes. The red viper is found in some parts of the s. of England.

The viper is the only venomous serpent found in Britain. Its bite is attended with much pain, and other serious consequences; but is seldom, if ever, fatal in Britain, although it is said to be so in warmer countries. The remedies employed for it are generally the external application of hot olive oil, and the internal use of olive oil and of ammonia, or strong stimulants such as brandy taken in large doses.

The viper inhabits heaths, dry woods, and dry banks. It preys on mice, frogs, small birds, and other small animals, which are killed by its poison-fangs, and swallowed entire. It hibernates during several months of the year, when many vipers may often be found entwined together in a torpid state. The poison is at this time inert, or nearly so. The viper is a good swimmer, and may occasionally be seen on lakes, such as Loch Lomond, crossing from one island to another. The young are produced in the early part of summer, from 12 to 20 or more at a birth. The viper is ovo-viviparous, the eggs probably bursting in the act of parturition. Their investing membrane is so thin and slight as to be very easily torn. The young viper is coiled up so closely in the egg as almost to appear a solid mass, but the moment it is set free it becomes active, and is ready to throw itself into an attitude of defense. The heat of the mother's body is not sufficient for the development of the embryo, as in mammals, but that of the sun is required, and the pregnant female viper may often be found stretched out in the sunshine, more lethargic than in ordinary circumstances.

It has often been alleged that vipers swallow their young, to preserve them from danger—as, indeed, other serpents also are said to do—and there is nothing unreasonable in the supposition, as the young could live for some time in the stomach of the mother; but evidence is still wanting of the fact. The subject has been discussed, time after time, in publications devoted to natural history, but the original uncertainty still remains. Witnesses evidently truthful assert the fact, but eye-witnesses of the act of swallowing are wanted, the sum offered by Mr. Frank Buckland to whoever will bring a viper with the swallowed young in her stomach, to be by him dissected, never having been claimed. That young vipers issue from the body of a crushed viper, is easily accounted for, from what has been already stated.

The name viper (Lat. *vipera*) is supposed to be a contraction of *vivipara*, and the derivation is doubtful. The name adder arose from writing *an adder*, for *a nadder*. The Ang.-Sax. is *nadre*, Old Eng. *naddere* or *cādere*, Scot. *nether*. It is unconnected with *attor*, poison.

Pliny, Galen, and other ancient writers, ascribe great medicinal virtues to broth made of vipers, and to the flesh of the animal. Vipers entwined together in hibernation were supposed to produce the *oram anguinum*, to which great virtues were imagined to belong; and *snakestones* were at one time quite common in many parts of Britain, sometimes rounded pieces of stone, rather larger than marbles, sometimes glass beads of various forms, which were supposed to cure vipers' bites, and to be otherwise useful.

VIPERIDÆ, a family of venomous serpents, having the upper jaw toothless, but with movable fangs in front, no pit between the nostrils and eyes, the scales generally keeled, the tail short and tapering. More than twenty species are known, natives of Europe, Asia, Africa, and Australia. No species has been found in America. To this family belong the common viper (q.v.) of Europe, the horned viper or cerastes (q.v.) of northern Africa and the w. of Asia, the puff adder (q.v.) of Africa, and the death adder of Australia. The death adder (*acanthophis tortor*) differs from most of the vipers in not having the scales keeled. It is widely diffused in Australia, where it is also known as the black snake. It is much dreaded, as its bite is said to be sometimes fatal in a quarter of an hour. It has two poison fangs on each upper jaw. The tail ends in a small recurved spine. The vipers are most numerous in warm climates, in which also their bite is more deadly than in colder ones.

VIPER'S BUGLOSS, *Echium*, a genus of plants of the natural order *boraginæ*, having a calyx with five deep segments, an almost bell-shaped corolla, with dilated throat, and irregular limb, very long unequal filaments, and a bifid style. The species are large herbaceous plants or shrubs, rough with tubercles and hairs. Their flowers are often very beautiful. The COMMON VIPER BUGLOSS (*E. vulgare*), a large annual plant, is a native of Britain and of most parts of Europe, growing in dry places, not unfrequently in corn-fields. Its flowers are at first reddish, and afterward blue. It derives its name, viper bugloss, from spots on its stem, which somewhat resemble those of the viper; and the property of healing vipers' bites was, therefore, ascribed to it. Other herbaceous species are found in the s. of Europe, North and South America, and other parts of the world. Shrubby species are found chiefly in the Canary islands and in s. Africa.

VIRCHOW, RUDOLF, pathologist and publicist, was born in 1821 at Cöslin, in Pomerania. He was a pupil of the great physiologist, Johann Müller; graduated in medicine in 1843; and became, in 1847, prosecutor to the university of Berlin. The same year he was commissioned by the government to investigate the cause and cure of typhus in Silesia; and also, in conjunction with Reinhardt, founded the annals of pathological anatomy and of clinical medicine. The political commotions of 1848 dragged him, in common with many other votaries of science, into the revolutionary vortex. He established a journal entitled the *Medical Reformer*, and also a democratic club, where he soon dis-

tinguished himself as an orator. He was, in consequence, elected a member of the national assembly, but was not admitted because he was, in a parliamentary sense, a minor. With the conservative reaction, Virchow had his journal suppressed, and lost his post, but was elected to the chair of pathological anatomy in Würzburg. His lectures at that university were widely popular for the novel views which he struck out particularly in cellular pathology. His reputation grew so great that he was recalled by Manteuffel in 1856 to Berlin, where he re-occupied the chair of pathological anatomy, and rendered it the most famous of its kind in Europe. In 1859, when the liberal cause revived, he became a member of the municipal council of Berlin, where he distinguished himself as a reformer of the arbitrary police system then rampant; and soon after was chosen deputy by the electoral college of Saarbrück, and by two of the Berlin colleges. He soon rose to the leadership of the opposition, and proved a most effective antagonist of the encroachments made in the name of the royal prerogative. He took the lead, in Jan., 1863, in carrying the address in which the ministry were accused of having violated the constitution. Such was the energy of his opposition, that in June, 1865, he was challenged to a duel by count Bismarck. In 1878 he retired from parliamentary life, in order to devote himself exclusively to science, after having been for years a prominent member of the advanced liberals in the Reichstag. Among his works are his inaugural thesis, *De Rheumate Corneæ* (1843); *The Colloid Tumours of the Ovaries, and on Cancer* (1847); *Cholera* (1848-49); *Fleuries of the Uterus, Scrofula, Tuberculosis, Typhoid Fever* (1850); *Cellular Pathology* (1850); *Amyloid Degeneration* (1853); *Morbus Spedalska* (a disease peculiar to the Norwegian coasts, 1859); *Trichiniasis* (1860); *Tumours* (1862); *Cellular Pathology in its foundation on Physiological and Pathological Histology* (1871); a notable article *On the Standpoints of Scientific Medicine* (1878). During the wars of 1866 and 1870-71, Virchow took an active interest in the sanitary arrangements for the troops in the field. He was elected honorary member of the royal medical society of London in 1856, and in 1859, corresponding member of the medical society of Paris.

VIRE, an ancient and pretty t. of Normandy, France, in the department of Calvados, on the Vire, 35 m. s.w. of Caen. It stands on a rock, is built of granite, and is surrounded by hills, between which are the celebrated valleys of Vire—*Faux de Vire* (see VAUDEVILLE). Pop. '72, 6,366.

VIREO, or **GREENLET**, the common name of a family of insectivorous birds, having a plumage more or less tinted with green and olive. In the genus *vireo* the bill is short and strong, nearly straight, notched and hooked at the tip. The wings are long and pointed; toes of moderate length; tail moderate and even. There are about 20 species, migrating from South America and the West Indies to the United States, arriving there in May, breeding during the summer, generally having two broods in a season, and returning in the autumn. Many of these beautiful birds are very sweet singers, and destroy a great many insects. The nest is made in trees and bushes of dried leaves, moss, grass, etc. The red-eyed vireo, *V. olivaceus*, is about 6 in. long, and a little over 10 in alar breadth. The tail is a bright olive-green above; top of the crown ashy, and white below. The iris is red. Its range is from eastern United States to Missouri, and from Greenland to Central America. A more southern species is *V. barbatulus*, or Whip-Tom-Kelly. The solitary vireo, *V. solitarius* of Baird, about 5½ in. long, and 9½ in alar extent, is found in the United States from the Atlantic to the Pacific. Upper parts dark olive-green; white rings around the eyes, two bands on the wings, and edge of secondary feathers white; greenish-yellow under the wings.

VIRGIL, the Magician, is the character in which the great Roman poet presented himself to the popular imagination of the middle ages. The origin of this singular delusion may be thus explained. From a very early period—almost, we may say, from the age in which he flourished—Virgil was acknowledged to be the prince of Latin poets. His poems threw all others into the shade, and this, not so much because they exhibited a finer and more original genius, as because their style was perfect, the subject of his *magnum opus* thoroughly national, and his immense historical and antiquarian lore devoted to the glorification of the Roman people. From him the grammarians selected the examples of their rules, and even composed treatises on special questions suggested by his poems. The rhetoricians, too, found there material for their themes and declamations, and the later poets imitated his phraseology. Very soon the idea sprung up that in his verses there lay hidden quite a peculiar wisdom and mystic meaning. Thus it happened that, as early as the 3d and 4th c., even Christian authors (e.g., Minutius Felix, Lactantius, and Augustine) had contracted the habit of regarding him reverentially, a feeling which, in its turn, induced them to use him for polemical, or at least theological purposes. Hence they sought to prove the beginning of the fourth eclogue a Messianic prediction, and would have it that Virgil foresaw the day of Christ. This view rooted itself so deeply, that Virgil and the Sibyl (q.v.) were actually introduced into the liturgy of the church, along with the Messianic prophecies of the Old Testament, and in the "mysteries" of the middle ages, are frequently cited as bearing witness to a coming Messiah. Furthermore, when the first ages of polemical theology arrived, biblical critics and controversialists did not hesitate to quote the verses of Virgil in elucidation of passages of Scripture, and in confirmation of their views. Later still, some of the scholastics endeavored to give a "moral" significance to the whole *Æneid*;

and an epitome of sacred history even was manufactured out of its contents (see CENTO). Another use, or rather *mis-use* of the verse of Virgil had already begun during the Roman empire, and affords additional evidence of the superstitious reverence that was gradually encircling the name of the poet: we allude to the custom of trying to discover one's fortune by selecting lines at random from his epic. See SORTES BIBLICÆ, SORTES VIRGILIANÆ. Ultimately, as may be seen from the *Divina Commedia* of Dante, Virgil came to be considered as a representative of pure enlightened reason; a highly-gifted genius standing midway between paganism and Christianity.

We have remarked that this deep, half-religious veneration for Virgil displayed itself at a very early period. Soon after his death, statues were erected to his memory, even in the domestic chapels of the emperors; the anniversary of his birth was held sacred; pregnant women and poets made pilgrimages to his tomb, and hence it became inevitable that all sorts of myths should spring up and attach themselves to his history; but the predominant conception in the middle ages was that of a wise, pure, and patriotic teacher, endowed with magic power and lore—quite a different kind of being from the evilly disposed and dreaded “sorcerer” of popular fancy. The Virgilian myths established themselves more especially in connection with the places where he was born, where he chiefly lived, and where he died—Mantua, Rome, and Naples; and there they even yet survive, in some measure, on the lips of the people. But, curiously enough, it was not from the Italians, but foreigners, that they first obtained literary consideration. The oldest document bearing on the subject of which we have any knowledge, is the *Otia Imperialia* of the Englishman, Gervase of Tilbury, who collected his stories from the mouths of the Neapolitan populace. A fuller account is to be found in the *Chronicle* of Arnold of Lübeck, who got his information from Conrad, bishop of Hildesheim, chancellor of the emperor Henry VI. These were followed by their contemporaries, Helinandus, whose legendary history of Virgil is embodied in the 6th book of Vincentius Bellovacensis' *Speculum Historiale*, and the English monk, Alexander Neckam, in his *De Naturis Rerum*, the best parts of which (relating to Virgil) are preserved in the repeatedly published *Vite Philosophorum* of Gualterus Burlanus. From these four main sources the later Virgilian myth-mongers have chiefly borrowed; of whom the two chiefly deserving notice are Buonamente Aliprando (author of a chronicle of Mantua in *terza rima*, about the beginning of the 15th c.), and the so-called Pseudo-Villani (author of *Le Croniche dell' inclita città di Napoli* (Naples, 1526). Particular stories and allusions are found pretty thickly scattered through the whole literature of the middle ages after the 13th century. The first complete collection, however, of the Virgilian myths was the French “people's book,” entitled *Faictz Marcueilloux de Virgille*, published in the beginning of the 16th c., by Jehan Trepperel at Paris, translations of which soon after appeared in Dutch and English. Even the distant Icelanders had heard of the great magician, and there still exists in MS. an Icelandic *Virgilius-Saga*. The greater part of the Virgilian myths collected in the “people's books” are of various ages and origin, and have come down to us in different forms. Some have decidedly been shaped after eastern models, but the majority are of Latin and Italian growth.—See Zappert, *Virgil's Fortleben im Mittelalter* (Vienna, 1851); Siebenhaar, *De Fabulis que Media Ætate de Virgilio circumferantur* (Berl. 1837); and Edgeland du Ménil, *De Virgile l'Enchanteur* in his *Mélanges Archéologiques et Littéraires* (Par. 1856).

VIRGILIA, a genus of leguminous trees, natives of s. Africa. Michaux referred to this, one of the finest North American trees, the yellow-wood, and called it *virgilia lutea*, but from differences in the pods and other parts, Rafinesque made a new genus for it, and called it *cladrastis tinctoria*, which is its present botanical name. The name of *virgilia* is, however, commonly applied to it. It grows to a height of 30 or 40 ft. and a diameter of about one foot. It has long compound leaves, with from seven to eleven leaflets, the base of the petiole being expanded to cover the bud of the following year. The flowers are in loose, pendent racemes from 10 to 20 in. long, of a pure white, except a small yellow spot in the center of each. They have the appearance of *papilionacea*, but their distinct stamens and other characteristics place them among the *sphoræa*. The pod is from 3 to 4 in. long, narrow, flat, and four to six seeded. The tree is hardy in the latitude of Boston, and it is easily raised from the seeds. It is a fine garden or lawn tree.

VIRGILIUS (or, as it is more accurately spelled, VERGILIUS) MARCO, PUBLIUS, after Homer, the greatest epic poet of antiquity, was born in the consulship of Crassus and Pompey, Oct. 15, 70, B.C., at Andes, a village not far from Mantua. It is probable that his father was the proprietor of a small estate which was farmed by himself. Virgilius was liberally educated, and is believed to have studied successively at Cremona and Mediolanum (Milan). In philosophy, he was instructed by Syron, an Epicurean, and one of his fellow-students was that Varus to whom his sixth eclogue is dedicated. Greek he learned at Neapolis (Naples) from the grammarian Parthenius. If we are correct in supposing that, in the first eclogue Virgilius relates his own experience in the person of Tityrus, he first visited Rome 41 B.C., in his 30th year, for the purpose of reclaiming his lands, which were occupied by the soldiery of Octavianus, at the close of the war against the republicans. At Rome, he was introduced to Octavianus, through the influence of Pollio, or of some other patron, and further formed the acquaintance of his great pro-

lector, Mæcenas. He continued to compose his eclogues—the tenth and last of which is dedicated to Gallus, and referred to the poet's 33d or 34th year. At the instance of Mæcenas, he commenced his *Georgics* in his 34th year, according to the grammarians, who also assign 7 years as the time he spent in the composition of the work, which was carried on principally at Naples. The *Æneid* was his last performance, and must have occupied many of the latter years of his life. He went in 19 B. C. to Greece, where he meant to subject his great poem to a thorough process of revision and refinement; and his voyage to Athens was made by Horace the occasion of the ode (book i. 3) commencing with "Sic te diva potens Cypri." At Athens, Virgilius met Augustus on his triumphal return from the east, and the poet was induced to go back to Rome in his company. He had only got as far as Megara, however, when he was seized with illness, which became worse on his voyage to Italy. On landing at Brundisium, or, according to another account, at Tarentum, he was unequal to the fatigue of traveling; and after lingering for a few days, he died, in the 52d year of his age, 19 B. C. In compliance with his dying wish, his body was removed to Naples, and buried at the second mile-stone from that city, on the Puteolan Way. Pliny the Elder and Aulus Gellius are among the writers who say that on his deathbed Virgilius desired his epic poem to be burned, rather than that it should see the light in its imperfect state; but that the injunctions of Augustus to his executors, or, according to others, the interposition of his friends Tucca and Varius, who persuaded him to bequeath it to them on the understanding that it should remain unaltered, were the means of preserving it. This incident is quite in keeping with all that we know of Virgilius's modesty of character. The liberality of his patrons had endowed him with considerable property. He had a house on the Esquiline, near the gardens of Mæcenas, where he lived with an elegant simplicity, while he allowed the public free access to his excellent library. He was tall of stature, dark of complexion, and had the appearance of a farmer. His most finished poem is the *Georgics*, in which the various departments of agricultural concern are described with great clearness, and illustrated by episodes of the finest poetry. His *Æneid* shows rather what he might have been than what he was as an epic poet. Unfinished as it is, however, its merits have always secured him a place in the front rank of epic writers; while, more than any similar work of antiquity, it has furnished a model to the epic and narrative poets of modern Italy. He has been edited and translated by scholars of nearly every country and period. The best English translation is that of the *Æneid* by William Morris (1875), which is on the whole superior to Dryden's, before unequalled. Conington's *Æneid* is in some features highly successful. The best editions are those of Heyne, Wagner, Forbiger, and Conington.

VIRGINALS, a keyed instrument of former times. As described by Dr. Burney, it resembled in form a small pianoforte, with a compass of four octaves, furnished with a quill and jack like those of the spinet, and a single string to each note. Queen Elizabeth is said to have been a skillful performer on the virginals; but the instrument cannot, as popularly supposed, have been named in honor of the virgin queen, having been so called before her majesty's time.

VIRGINIA, one of the thirteen original United States of America, lies in lat. 36° 31'—39° 27' n., and long. 75° 13'—83° 37' w.; bounded on the n. by Pennsylvania, Maryland, and West Virginia, e. by Maryland and the Atlantic, s. by North Carolina and Tennessee, and w. by Kentucky and West Virginia. Area, 38,352 sq. m., or 24,545,280 acres. It is divided into 99 counties. The chief towns are Richmond (the capital), Petersburg, Norfolk, Staunton, Waynesborough, Alexandria, Portsmouth, Lynchburgh, and Fredericksburg. Chesapeake bay, which divides the s.e. portion of the state, affords deep and spacious harbors. The chief rivers are the Potomac, forming the n.e. boundary; the James, York, Chickahominy, Rappahannock, Rapidan, Appomattox, Shenandoah, and the Nottaway and Roanoke, which empty into Albemarle sound in North Carolina. Eastern Virginia is level or rolling land, rising gradually from the ocean and Chesapeake bay. The w. portion is hilly and mountainous; while through the center from n.e. to s.w. run three ranges of the great Appalachian system of mountains: (1) a low range on the e. commencing with the Bull Run mountains, near the Potomac; (2) the Blue Ridge, more elevated, through which the Potomac passes at Harper's Ferry, and which forms the e. boundary of the Shenandoah valley; (3) the great North Mountain and the Alleghany, which form for many miles the n.w. boundary of Virginia. The highest peak in the state is Balsam mountain (5,700 ft.) in the Blue mountains. Other peaks rise to 4,000. The valley of Virginia, or of the Shenandoah, is from 1200 to 1500 ft. above the sea. The e. coast is composed of tertiary sands, clays, and marls; further inland, strata of the miocene groups emerge from beneath these, and abut against granite, gneiss, and other metamorphic rocks, at the line of the lowest falls of the principal rivers, the head of navigation, and sites of the chief towns. In the metamorphic belt are gold mines, copper, iron, etc. There are two upper secondary belts parallel to the Blue Ridge, crossing the James above Richmond, with rich coal deposits. The valley is of the lower Silurian, with rich limestones, hematite iron, and a fertile soil. On the w. borders are mineral springs (hot and cold, sulphur, salt, gypsum, lead, etc.). The western coal region, cut through by large rivers, is one of the finest in the world. There are also deposits of fine marble, porcelain clay, fire-brick clay, fine granite, soap-stone, slate, etc.

Among the curiosities are the natural bridge in Rockbridge co.; Weir's cave in Augusta co.; Blowing cave, which sends out a blast of cold air in summer, and draws in air in winter; flowing and ebbing springs; the natural tunnel, 70 ft. high; and the Hawk's nest, a pillar 1000 ft. high. The climate of the e. and s.e. is hot with malaria in the swampy river bottoms, producing bilious and remittent fevers; the higher regions are cold in winter, but a large portion of Virginia is pleasant and healthful. The soil of the e. portion is light and good, but much exhausted by repeated tobacco-crops. The valley is rich, producing wheat, Indian corn, tobacco, and various fruits. The chief products are tobacco, flour, cotton, wool, coal, lumber, oysters, market-vegetables and game. The internal commerce is carried on by the James river, several canals, and (1878) 1635 m. of railway. In 1878 the state debt was \$29,350,000, and the taxable real property was assessed at \$246,391,193. There is at Richmond a normal school, and a colored normal industrial school at Hampton. A system of free public schools, under the control of a board of education, a state superintendent, county superintendents, and district trustees, has been established in Virginia, but its effective operation has been rather tardy. In 1870, trustees were appointed in ten out of the ninety-nine counties, and a number of free schools were established. There are state institutions for blind, and deaf and dumb. The insane asylum is the oldest in the United States. The government is republican, with a governor and two houses of the legislature, elected by the suffrages of every male citizen, voting *virâ voce*.

Virginia, whose shores were first explored by Sebastian Cabot, 1498, and again under the auspices of sir Walter Raleigh in the reign of queen Elizabeth, in whose honor it was named, was first settled by an English colony, under the charter of the London company, at Jamestown, on the James river, May 13, 1607—a colony consisting of gentlemen of fortune, and persons of no occupation, no families, twelve laborers, and very few mechanics. The friendly Indians sold them land and provisions; but the diseases of a damp climate swept off half the settlers the first autumn. The energy of captain John Smith saved the colony from destruction; and in 1609, it was re-enforced with 500 persons, including 20 women and children, who were reduced by sickness and starvation to 60. They had embarked to abandon the settlement, when lord Delaware came with emigrants and supplies. The marriage of John Rolfe to Pocahontas (q.v.) secured the friendship of the Indians. In 1619, 90 respectable young women were sent out from England, and sold to the planters for 100 lbs. of tobacco each; also 100 convicts, to supply labor; and a Dutch trader also sold them 20 negroes. In 1622, the colony was reduced by wars and massacres from 4,000 to 2,500; but in 1624 it became a crown colony, and increased, so that, in 1649, there were 15,000 English, with 300 "good negro servants," and 20 churches. The great production of tobacco caused such a fall in price, that half the crop was burned. In 1671, the population was 40,000, including 2,000 black slaves, and 6,000 English convicts and redemptioners, of whom 1500 a year were imported. The now prosperous colony consisted of 48 parishes, but had, governor sir William Berkley thanks God, no free schools or printing, which he hopes they may keep free of for a hundred years, and says: "God keep us from both!" In 1754, the colonial militia took part in the French war; and maj. George Washington was in gen. Braddock's expedition. In 1769, Thomas Jefferson, a member of the house of burgesses, which had been established in 1619, asserted for the colony the right of self-taxation, denying the right of parliament to tax the colonies. In 1773, Patrick Henry, Thomas Jefferson, and Richard Henry Lee were appointed a committee to confer with the other colonies, and urged upon their delegates the declaration of independence. Virginia the earliest settled, largest, and most populous of the thirteen original states called the Old Dominion, has been called the mother of presidents, four out of the five before 1825 having been Virginians. She was the first to propose the confederacy and the constitution. In 1861, April 17, the legislature of Virginia passed the ordinance of secession. The confederate government was invited to Richmond, which became the center of military operations. Virginia was restored to her place in the family of states on the Jan. 26th, 1870. See UNITED STATES. The pop. of Virginia in 1800, was 886,200, of which the slaves were 345,796; '20, 1,065,379—slaves, 425,153; '70, 1,596,318—slaves, 490,865; '70, 1,235,177—and no slaves.

VIRGINIA (*ante*), has six great natural divisions extending from n.e. to s.w. nearly parallel, and corresponding to the trend of the Atlantic coast on the e. and of the Appalachian range on the north-west. They differ in geology, climate, soil, and productions. Beginning on the e., they are the tide-water, middle, Piedmont, Blue Ridge, valley, and Appalachian sections. The tide-water portion is divided by Chesapeake bay and the large tidal rivers which flow into it, into nine primary and many subordinate peninsulas, no part of which is elevated more than 100 ft. above the sea, and considerable tracts are low and marshy. Middle Virginia, a triangular tract extending from a n. and s. line running through Richmond to the foot-hills of South-west mountain, is a wide, undulating plain of no great elevation (perhaps an average height of 400 ft.) through which the many rivers that traverse it have cut their channels to a considerable depth, and are bordered by alluvial bottom-lands. Along the e. base of the Blue Ridge mountains, and between them and the coast range, the Piedmont division extends from the Potomac and Maryland to the Dan at the North Carolina border. It is 244 m. long, with an average width of 25

m., and an area of about 6,000 sq.miles. The Blue Ridge division is a still narrower belt. It includes both slopes of the Blue Ridge, and forms the eastern wall of the valley of Virginia, the fifth division, which is a part of the great Appalachian valley, lying between the Blue Ridge on the e. and the Endless mountains on the west. The valley is a broad belt of rolling country from 1200 to 1600 ft. above the sea, diversified by hills and valleys, with several streams. The Appalachian division is a mountainous region traversed by the Alleghany ranges. In Virginia it is about 260 m. long and from 10 to 50 wide, and comprises 7,680 sq.miles. The highest peak in the state, Balsam mountain (about 5,700 ft.), is in the Iron mountains, between the Blue Ridge and the Alleghany range, on the border of North Carolina.

The state is rich in minerals, which are as yet mostly undeveloped. They comprise gold, iron, copper, lead, zinc, semi-bituminous and bituminous coal, granite, limestone, marble, freestone, greenstone, brown stone, brick and fire clays, glass sand, plumbago, manganese, gypsum, salt, etc. Gold is found in a belt from 15 to 25 m. wide and 200 m. long, extending from Washington to Halifax Court-House. Iron and coal abound in several parts of the state; and lead and zinc are found in the valley region. The soil of the tide-water division is a light sandy loam, capable of yielding large crops of fruit and vegetables; but it has been to a great extent worn out by superficial cultivation. In middle Virginia much of the land is fertile, and much is poor and sterile. The soils of the Piedmont region, consisting largely of decomposed greenstone, are very fertile, as are also portions of the Blue Ridge country; but where the sandstones prevail on the western slope they are sandy and poor. The valley soil is underlaid with disintegrating limestones, shales, slates, and clays, and is very fertile; and many of the valleys in the Appalachian region are rich and productive. The forest trees of the state are numerous, and differ on different soils. In the tide-water section are extensive forests of pine (the noted yellow Virginia), oak, cypress, cedar, and locust, from which large quantities of timber and sawed lumber are obtained. The middle region contains large areas of superior hard pine, black, white, and other oaks, holly, and other trees; the Piedmont has considerable forest land, with oak of many varieties, hickory, tulip-poplar, black walnut, locust, cedar, chestnut, and pine; the Blue Ridge is mostly covered with forests of oak, hickory, chestnut, locust, and birch; the valley has much superior hard-wood timber, especially oaks and hickories; and in some parts of the Appalachian country are extensive forests that include oak, walnut, tulip-poplar, locust, sycamore, and pine.

The climate varies much in different districts. The mean annual temperature for the state ranges from 60° and 64° in the s.e., to 48° and 52° in the valley and Appalachian region, while the annual range, from the severest cold of winter to the greatest heat of summer, is not more than 86°. In the e. and s.e. the summers are hot, and in the vicinity of swampy lands bilious and typhoid fevers prevail. The region lying on and near Hampton Roads is, however, healthful and agreeable at all seasons of the year; and the valley has a healthful climate, the summer heat being tempered by the elevation and the cool breezes, while it is also sheltered by the mountains from the intense cold of winter.

The history of the state is noticeable. For many years after the adoption of the federal constitution, the state maintained a predominant interest in the affairs of the nation. Its many eminent public men and constantly increasing importance in wealth and population gave it great influence. When the secession of the southern states from the union began to be considered, the people of Virginia were divided in their desires. Many of them were strongly attached to the union and objected to a separation. Jan. 7, 1861, the legislature met in extra session, and subsequently provided for the assembling of a convention to determine what course should be adopted by the state, and passed resolutions recommending the states to appoint commissioners to a national peace convention to be held in Washington. Nothing beneficial resulted from this proceeding, however, for the failure to procure such guaranties from the northern states as desired, the adoption of a warlike policy by the general government, and the capture of fort Sumter, led to the passing on April 17 of an ordinance of secession by a vote of 88 yeas to 55 nays. Immediately afterward the state authorities took possession of the custom-house in Richmond, the navy-yard at Norfolk, the U. S. arsenal at Harper's Ferry, and other federal property; troops were called out, and money was raised for arming and equipping them. May 7 the state was admitted to representation in the confederate congress, and later in the month Richmond was made the seat of the confederate government. From this time during the whole of the war that followed, Virginia was occupied by hostile armies and was the region of almost continual military operations, by which it suffered much. There were fought within the state the great battles of Bull Run, Carnifex Ferry, Ball's Bluff, Williamsburg, Winchester, Hanover Court-House, Seven Pines, Fair Oaks, Cedar Mountain, Manassas, Fredericksburg, Chancellorsville, Hanover Junction, the series of battles from the Wilderness to Cold Harbor, in May and June, 1864, Petersburg, Cedar Creek, Fisher's hill, the battles in the valley, Lynchburg, and Five Forks. During most of the time there were two state governments in Virginia, the w. counties having maintained allegiance to the union and instituted a separate government under federal control. After the surrender at Appomattox Court-House this government was recognized by the president as the lawful one, and for a while the whole state became subject to it. Under the act of congress of Mar. 2, 1867, providing military governments for the southern states, Virginia was made the first military district, to the command of which gen. Schofield

was appointed. A registration of voters (excluding all that could not take a prescribed oath) was taken, preliminary to a vote for determining whether a constitutional convention should be held, and the choice of delegates to such convention. The number of voters registered was 221,754, of whom 116,982 were white and 104,772 colored. The vote and election took place on Oct. 22, when 14,835 whites and 92,507 colored voted for, and 61,249 whites and 638 colored voted against, the convention. The total vote was 169,229, and the majority for the convention 45,455. It assembled in Richmond in December, and provision was made for submitting a constitution that the w. counties had previously framed to a popular vote; but the vote was postponed and the new constitution was not ratified by the people until July 6, 1869. On the assembling of the legislature in the following October, the fourteenth and fifteenth amendments to the federal constitution were ratified; and in January the state was restored to its place in the union.

Of the total population of the state in 1870, 597,058 were males, and 628,105 females; 1,211,469 were of native and 13,754 of foreign birth. The density of the population was 31.95 persons to a sq. mile. There were 231,574 families with an average of 5.29 persons to each, and 224,947 dwellings, with an average of 5.45 persons to each. About 412,600 persons were engaged in occupations, of whom 162,604 were farmers and planters, 108,400 laborers, 54,000 domestic servants, 1075 lawyers, 2,126 physicians and surgeons, 1073 clergymen, 2,521 teachers, 20,181 merchants, and 49,413 manufacturers. By the census of 1880 the total population was 1,512,203, showing a gain in ten years of 287,040. The males numbered 745,554, and the females, 766,656; those of native birth, 1,497,565; of foreign, 14,638; the whites, 880,376; the colored, 631,827. The recent settlement of many English and other agriculturists in the state has given promise of prosperity for the farming interests. The only definite statistics at present obtainable, however, are those of 1870. At that time the amount of land in farms was 18,145,911 acres, of which 8,165,040 acres were improved. The average size of farms was 246 acres; their aggregate value, \$213,020,845; and the value of the farm products for the year, \$51,774,801. No state in the union, except Kentucky, equals Virginia in the amount and value of its ancient staple, tobacco; but the spread of the system of mixed agriculture has diminished its importance to some extent. In 1870 there were produced 37,086,364 pounds. Some cotton is produced in the tide-water section, and flax and hemp are raised, but not extensively. Of the cereals in 1870, there were raised 7,398,787 bushels of wheat, 582,264 of rye, 17,649,304 of Indian corn, 6,857,554 of oats, 7,259 of barley, and 49,075 of buckwheat. Other products were 877,110 pounds of wool, 159,883 tons of hay, 10,999 pounds of hops, 245,093 of maple sugar, 329,155 gallons of sorghum, and 11,400 gallons of maple molasses, 1,293,853 bushels of Irish potatoes, 865,882 of sweet potatoes, 162,102 of peas and beans, 26,438 pounds of beeswax and 505,239 pounds of honey, 26,283 gallons of domestic wine, 11,367 bushels of clover-seed, 12,709 of grass-seed, 6,979,269 pounds of butter, 71,743 pounds of cheese, and 266,812 gallons of milk. The value of the live stock in the state was estimated at \$28,187,669, and consisted of 168,938 horses, 26,903 mules and asses, 573,152 neat cattle of which 188,471 were milch cows, 370,145 sheep, and 674,670 swine. The manufacturing interests of the state have been developed slowly, though its great variety and abundance of raw material, the ample water-power, and the convenience and extent of transportation facilities give it marked advantages. In 1870 the manufacturing establishments numbered 5,933, employed 26,974 hands, possessed an aggregate capital of \$18,455,400, paid \$5,343,099 in wages, used raw material valued at \$23,832,384, and produced goods annually valued at \$38,364,322. The most prominent establishments were the tobacco factories at Lynchburg and Danville, the flour manufactories in Alexandria, and the iron foundries in Richmond. The principal other establishments were 173 saw mills, 11 cotton mills, 172 tanneries, 37 factories for the manufacture of agricultural implements, 186 carriage and wagon shops, and 4 paper mills. The products of mines and quarries in 1870 amounted to \$409,914, including bituminous coal valued at \$226,114; copper, \$8,000; gold quartz, \$31,000; iron ore, \$23,000; lead, \$23,000; slate, \$42,800; stone, \$51,000; and zinc, \$5,000. The amount of capital invested in mining amounted to \$1,113,000, of which \$779,200 was invested in the coal industry. In commerce the state has not been very prominent, especially in the coastwise trade. Lately, however, the ports have begun to take a prominent share in the foreign trade, and Norfolk particularly has become a leading cotton port. The other ports of entry are Petersburg, Alexandria, Richmond, Yorktown, Tappahannock, City Point, Suffolk and Williamsburg; while several other places on tide-water are shipping points of some importance. The leading exports are tobacco, naval stores, cotton, and lumber. Their value for the year ending in June, 1875, was \$8,189,327, and the value of the imports, \$487,982. The railroad facilities for traffic compare favorably with several of the northern states, and are constantly improving. The most important roads are the Atlantic, Mississippi and Ohio, and its branches, 427 m. in length; the Washington City, Virginia Midland and Great Southern, with 2 branches, 315 m.; the Chesapeake and Ohio, with 2 branches, 232 m. within the state; the Richmond and Danville, 141 m. in the state; the Richmond, Fredericksburg and Potomac, 120 m.; the Richmond and Petersburg, with 3 branches, 108 m.; the Seaboard and Roanoke, 60 m. in the state; the Richmond, York River and Chesapeake, 38 m.; the Washington and Ohio, 52 m.; the Valley railroad, 104 of its 207 m. in the state; and the Fredericksburg and Gordons-

ville, 20 miles. Other facilities are the James river and Kanawha canal, from Richmond to Buchanan, 198 m.; the Albemarle and Chesapeake canal, from Norfolk to Albemarle sound; the Dismal Swamp canal, which makes the same connections by another route; and a canal from Alexandria to Georgetown, connecting with the Chesapeake and Ohio canal. The commercial transactions and wealth of the state sustained in 1875, 20 national banks, having a paid-up capital of \$3,590,000, bonds on deposit to the amount of \$3,676,750, and outstanding circulation to the amount of \$3,615,000; 33 state banks with an aggregate capital of \$3,413,600; 13 savings banks, with capital and deposits amounting to \$982,300; and 37 private banking-houses. The insurance companies numbered 19 fire and marine, and 5 life insurance, the first of which possessed assets amounting to \$5,400,000, and the second those amounting to \$2,800,000.

The assessed value of real and personal estate in Virginia in 1870 was \$365,439,917, including \$279,116,017 of real and \$86,323,900 of personal. But the true value was estimated to be \$409,588,133. Since then, however, the first totals have shrunk considerably by reason, it is stated, of a change in the mode of assessing license taxes. The total revenue of the state in 1879 was \$2,762,519, derived from a tax of 50 cents per \$100 on total value of real estate (assessed at \$244,563,717); a tax of 50 cents per \$100 on personal property (assessed at \$71,013,105); a tax of 1 per cent on incomes exceeding \$600; a capitation tax of \$1 on male citizens over 21 years of age; taxes derived from railroads, bank, and insurance companies; and revenues derived from licenses and other minor sources. The state debt in 1879 amounted to \$29,667,304, the most of which had been contracted in the construction of railroads and canals. The estimated expenses of the government were \$701,118, and the amount estimated to be due to the public free schools annually was \$487,442, which left an annual surplus from the yearly revenue applicable to the payment of interest on the debt, and to the extraordinary expenses of government, amounting to \$1,397,517.

The present public school system of the state, which is similar to that of most of the states, dates its organization from 1870. Previous to that year the free schools had received little attention. The general supervision is vested in a superintendent of public instruction, elected every four years by joint ballot of the general assembly; and the board of education consists of the governor, attorney-general, and the superintendent. The schools are supported by state and local taxation and an annual state fund, \$478,750, mentioned above. Substantial aid is received also from the Peabody educational fund. In 1875 the receipts from all sources for school purposes amounted to \$1,021,396. The school population at that time was 482,789 children; of whom 280,149 were white and 202,640 colored; the number of pupils enrolled was 184,486 (only about 38 per cent of the whole), of whom 129,545 were white and 54,941 colored; the average daily attendance was reported to be 74,056 whites and 29,871 colored. The number of schools was 4,135, of which 1064 were wholly for colored children. These had 2,360 white male and 351 colored male teachers, and 1363 white female and 188 colored female teachers. The number of school-houses used was 4,561, of which 2,101 were log, 1617 frame, 129 brick, and 38 stone. Altogether the value of school property owned by the districts was estimated to be \$757,181. Of the academies, seminaries, and parochial schools, 5 are under the control of the Presbyterians, 3 of the Baptists, 4 of the Protestant Episcopal church, 4 of the Methodist Episcopal church, South, 3 of the Roman Catholics, and 1 of the Lutherans. Most of these schools are endowed and in a prosperous condition. The principal universities, colleges, and professional schools in the state are, the university of Virginia, near Charlottesville [see VIRGINIA, UNIVERSITY OF]; the college of William and Mary (Prot. Episcopal) at Williamsburg; Washington and Lee university at Lexington; Emory and Henry college (M. E., South) at Emory; Hampden-Sidney college (Presbyterian) at Hampden-Sidney; Randolph-Macon college (M. E., South) at Ashland; Richmond college (Baptist) at Richmond; Roanoke college (Lutheran) at Salem; the Virginia military institute, at Lexington; the Hampton normal and agricultural institute (Am. Miss. Assoc., Congregational) at Hampton; the Union theological seminary of the general assembly (Presbyterian) at Hampden-Sidney; and the medical college of Virginia at Richmond. Many of these institutions have been in existence a long time, the first three especially, and are colleges of distinction. Other educational advantages are afforded by two state libraries with 22,700 vols.; 12 court and law libraries with 2,117 vols.; 1146 Sunday-school, with 182,436 vols.; 232 church, with 75,233; and 12 circulating libraries, with 52,781 vols. The number of newspapers and periodicals is about 145; including 21 dailies, 92 weeklies, and 11 monthlies. The total number of religious organizations in 1870 was 2,582, having 2,405 edifices with 765,127 sittings, and property valued at \$5,277,368. The churches were of the following denominations: 849 Baptist, 100 Christian, 185 Protestant Episcopal, 12 Friends, 8 Jewish, 80 Lutheran, 1011 Methodist, 1 Moravian, 3 Swedenborgian, 204 Presbyterian, 1 Reformed church in America, 24 Reformed church in the United States, 19 Roman Catholic, 42 United Brethren in Christ, and 43 not designated.

The constitution of the state gives the right of voting to every male citizen of the United States 21 years old who has resided in the state one year, and in the county, city, or town in which he offers to vote, three months next preceding any election. Persons entitled to vote and hold office, and none others, may sit as jurors. The governor and lieutenant-governor are elected by the people every four years. The secretary of

the commonwealth, treasurer, and auditor of public accounts are elected every two years by a joint vote of the general assembly. This assembly, or the legislature, consists of a senate of 43 members and a house of 138 delegates, the former of which are elected for four years, the latter for two. The judicial power is vested in a supreme court of appeals, circuit courts, and county courts. The constitution requires taxation to be uniform and equal, and the legislature may exempt all property used exclusively for state, county, municipal, benevolent, charitable, educational, and religious purposes. Besides the usual two senators, the state is represented in congress by 9 representatives, and has 11 votes in the electoral college. The electoral votes have been cast as follows: 1788, Washington, 10, vice-p. scattering; 1792, Washington and Clinton, 21; 1796, Jefferson, 20, vice-p. scattering; 1800, Jefferson and Burr, 21; 1804, Jefferson and Clinton, 24; 1808, Madison and Clinton, 24; 1812, Madison and Gerry, 25; 1816, Monroe and Tompkins, 25; 1820, Monroe and Tompkins, 25; 1824, Crawford and Macon, 24; 1828, Jackson and Calhoun, 24; 1832, Jackson and Van Buren, 23; 1836, Van Buren and Smith, 23; 1840, Van Buren, 23, vice-p. scattering; 1844, Polk and Dallas, 17; 1848, Cass and Butler, 17; 1852, Pierce and King, 15; 1856, Buchanan and Breckinridge 15; 1860, Bell and Everett, 15; 1864 and 1868, *no vote*; 1872, Grant and Wilson, 11; 1876, Tilden and Hendricks, 11; 1880, Hancock and English, 11.

VIRGINIA, a city of Nevada, which has grown into importance with a rapidity that few even among American towns can parallel. Settled after 1860, it had in 1870 a population of 7,048, and its increase since then may be imagined from the fact that 10,000 people were left homeless by a fire which destroyed *part* of the city in 1875.

VIRGINIA (*ante*), a city in w. Nevada: settled 1859; incorporated 1861; co. seat of Storey co.; 180 m. in a direct line from San Francisco, 15 m. n.e. of Carson City, 53 m. s. of Reno, on the Central Pacific railroad; pop. '80, 13,705. It is built on the e. slope of mount Davidson, a peak of the Washoe range of the Sierra Nevada, seamed by the operations on the rich silver mines, about 7,827 ft. above the level of the sea. It contains the Comstock lode, with ores of about $\frac{1}{2}$ value of gold, and $\frac{2}{3}$ of silver, discovered in 1859 by a Virginian, hence the name of the city. In this mine is the famous Suto tunnel, constructed to facilitate mining operations. Virginia also contains the Big Bonanza or consolidated Virginia, the annual yield of which is estimated as over \$10,000,000 worth of silver; about equal to the Comstock lode, the Virginia yielding in one month \$3,634,000. The California mine extends further n., and is also remarkable. The buildings in Virginia are principally of stone and brick; the streets are broad, graded at great expense, and without trees. It has many fine residences, is lighted with gas, and supplied with water from springs at the summit of the Sierra Nevada conducted through iron pipes. It contains a court-house, a Roman Catholic school, agencies of the Nevada bank of San Francisco, and bank of California, 5 churches, 2 theaters, 3 daily and 2 weekly newspapers, public schools, and a branch banking house of Wells, Fargo & Co.

VIRGINIA CITY, a city in s.w. Montana, settled 1863, incorporated 1865; co. seat of Madison co., and capital of the territory until 1875, when the seat of government was removed to Helena. It is situated on the e. slope of the Rocky mountains, 110 m. in a direct line from Helena; pop. '70, 1500. It is built in Alder gulch, 16 m. long, 5,713 ft. above the level of the sea, in the center of a rich gold mining district. In the first 8 years after the discovery of gold in 1863, \$30,000,000 worth of gold was taken from this vicinity. Other mineral products are silver, limestone, gneiss, galena, and serpentine. It is connected with Dillon, the terminus of the Utah Northern railroad, by regular stage lines. It has a court-house, jail, 3 churches, 2 newspapers, 2 banks, and a public library. In the vicinity are hot springs with medicinal qualities.

VIRGINIA. UNIVERSITY OF, an institution of learning at Charlottesville, Albemarle co., Va.; 4 m. from Monticello, the seat of Jefferson, by whom it was planned and organized. It was chartered by the state in 1819, and opened in 1825. It is governed by a rector and 9 visitors. It has schools of ancient languages and history; modern languages, history, and literature; mathematics, natural philosophy, law, medicine, etc. The state pupils are free. Each student must attend three schools, and each school confers its own degrees. Those who have degrees in two or three schools receive the degree of bachelor of arts; those who take degrees in six schools receive that of master of arts. There were in 1875-76, 330 students. Library, 36,000 vols.

VIRGINIA. UNIVERSITY OF (*ante*), near Charlottesville, Albemarle co., Va.; established by Thomas Jefferson, 1825. In this institution there is no curriculum or prescribed course of study to be pursued by every student. In establishing it Mr. Jefferson, for the first time in America, threw open the doors of a university in the true sense of the name, providing, as amply as the available means would permit, for thorough instruction in independent schools in all the chief branches of learning, assuming that the opportunities for study thus presented were privileges to be voluntarily and eagerly sought, and allowing students to select for themselves the departments to which they are led by their special tastes and proposed pursuits in life. No honorary degrees are conferred. The course of study embraces—1. A literary and scientific department; 2. A medical department; 3. A law department. The library, originally selected and arranged by

Mr. Jefferson and since enlarged, contains about 36,000 vols. The Brooks museum of natural history, consisting of well-selected cabinets of zoology, mineralogy, and geology, and a botanical collection, are arranged in a handsome building, and furnish ample illustration in their several departments. There is a well-appointed infirmary connected with the university for the care and comfort of sick students. Every student on admission deposits the infirmary fee, which entitles him, in case of sickness during the session, to the advice and attention of the infirmary physicians, and if necessary, to nursing by professional nurses, without additional charge. Attendance on religious services is purely voluntary. The university has an income of over \$36,000. Number of professors (1879-80), 17; other instructors, 7; students, 329. James F. Harrison, M.D., is chairman of faculty.

VIRGINIAN CREEPER. See VITACEÆ.

VIRGINIAN QUAIL, or COLIN, *Ortyx*, a genus of birds of the family *tetraonidae* closely allied to quails and partridges, but differing from both in having a shorter and thicker bill, and a rather more lengthened tail. They are all natives of America. The best-known species is the VIRGINIAN COLIN (*O. Virginiana*), which is abundant in most parts of North America, and in some parts is commonly known by the name of quail, in others by that of partridge. In size it is intermediate between the common quail and the common partridge of Britain. The prevalent color of the plumage is brownish-red, the under parts whitish; but all parts are more or less mottled with different colors. The feathers of the head are capable of being erected into a sort of crest. The call of the male is popularly regarded as resembling the words, *Ah, Bob White!* The coveys of the Virginian quail often approach houses in winter, and mingle with domestic poultry. Great numbers are killed by guns and taken in snares; and in the western and southern states many hundreds are often caught in a day by parties of men on horseback, who drive the coveys into a great cylindrical net. This bird is easily domesticated, and seems well fitted for the poultry-yard. It has been introduced into some parts of Europe, and may almost be regarded as naturalized, although still rare in England.—There are several other species of the genus in Mexico, California, and the n.w. of America, of which one, the CALIFORNIAN COLIN (*O. Californica*), is remarkable for its long and beautiful black crest.

VIRGIN ISLANDS, a group of islands in the West Indies, partly belonging to Denmark, partly to Britain, directly e. of Puerto Rico. The islands and islets are about 50 in number, but of these, only a few are of any considerable size or importance. Three of the islands, with an area in all of 119 sq.m., belong to Denmark—viz., St. Thomas (see THOMAS, ST.), St. Croix (see CROIX, STE.), and St. John (with an area of 21 sq.m.); and the other islands, the chief of which are Tortola, Virgin-Gorda, Anegada, Vieque, and Culobra, belong to Great Britain. The area of the British possessions of the Virgin islands is 94 sq.m., or over 60,000 acres (returns for 1871); and the pop. in 1871 was 6,651, of whom 123 were white, 1963 colored, and 4,565 black. The characteristic physical features are rugged heights and precipitous coast-lines, marked by numerous bays, havens, and creeks. Extensive tracts of land, possessed by the emancipated blacks, are covered with guinea-grass, which forms good pasturage for cows, sheep, and goats. A valuable mine of copper has been worked at Virgin-Gorda; and gold, silver, and other valuable minerals are said to have been found; but the inhabitants obtain their livelihood chiefly by wrecking. In 1876 the revenue amounted to £2,131, the expenditure to £2,039. The value of the exports in the same year was £4,694; of the imports, £2,658. Cotton, sugar, ginger, and indigo are the principal products.

VIRGIN MARY. See MARY.

VIRGIN'S BOWER. See CLEMATIS.

VIRIATHUS, a Lusitanian (i.e., Portuguese) patriot, who energetically strove to prevent his country from falling under the dominion of the Romans. He flourished in the 2d c. B.C. Originally a shepherd, he afterward became a guerrilla chief, and appears to have supported himself (like many of the Lusitanian borderers) by predatory excursions into the neighboring Spanish territory. This mode of life brought him into collision with Rome, and in the year 151 B.C., the propraetor, Ser. Galba, was ordered to invade the country, and reduce the Lusitanians to subjection. By an act of detestable treachery Galba succeeded in destroying a large body of the natives; but the few who escaped (among whom was Viriathus) were inspired with the most implacable animosity toward the Romans, and immediately proceeded to rouse the patriotic passions of their countrymen. Viriathus soon rose into prominence. At first he kept mainly to the mountains, and contented himself with harassing the enemy by sudden and fierce descents, but in 147 (having been formally chosen leader in a season of great peril) he gave battle to Vetilius, the Roman propraetor, near Tribola (a town of Lusitania, s. of the Tagus), and inflicted on him a severe defeat. In the course of the next two years he repeatedly came off victorious in conflict with Roman armies; until in 144 the consul, Q. Fabius Emilianus, encountered him in Andalusia with a large army of 15,000 foot and 2,000 horse, and Viriathus was driven back into his native fastnesses. But the Spanish tribes themselves now broke out in insurrection against their foreign masters; and after 143 the Romans had both a Numantine and a Lusitanian war to wage. The

general sent against Viriathus was the proprætor, Q. Pompeius, who, after a slight temporary success, was utterly crushed at the "hill of Venus," and forced to take refuge at Corduba (in Andalusia), while the conqueror wasted all the country round the Guadalquivir. Next year (142), the Romans were more fortunate. Q. Fabius Servilianus, consul, conducted the war, and succeeded in driving Viriathus once more out of Spain, and in annihilating several guerrilla bands; but in 141 a terrible reverse befell him near Grisane, when the whole of his army was hopelessly surrounded in a mountain-pass, and the story of the Caudine Forks (q.v.) was repeated, by its unconditional surrender. Viriathus, like Caius Pontius, showed a noble magnanimity in his hour of supreme triumph; he allowed his captives to go away free and unhurt on condition of Servilianus allowing the Lusitanians to retain their independence, and accepting their alliance. His terms were accepted, and the Portuguese patriot seemed to have triumphed over his colossal adversary; but in 140 the consul, Q. Servilius Cæpio (brother of Servilianus), having received the command in Further Spain, suddenly and treacherously resumed the war against Viriathus, and fearing lest he should not succeed in fair fighting, bribed some Lusitanian envoys (who had been sent to him by Viriathus with offers of peace) to murder their master, which they did while he lay sleeping in his tent. The death of this heroic chief was practically the ruin of Lusitanian independence; for though the followers of Viriathus elected another leader in his place, and strove to carry on the war, they could scarcely maintain themselves in the field for the rest of the year, and were then glad to acknowledge the supremacy of the Romans.

VIRTUAL VELOCITY. See WORK.

VI RUS (the Lat. for a *poisonous liquid*) is a term used in medicine to signify those mysterious poisonous agencies which produce zymotic diseases (q.v.), such as small-pox, measles, scarlatina, the various forms of continued fever, ague, whooping-cough, cholera, syphilis, glanders, hydrophobia, etc. While each of these morbid poisons (as they are frequently called) has a definite and specific action, they collectively obey certain laws. For example (1.), their actions are variously limited, some affecting only one organ or system of organs, while others involve two or more organs or system of organs. Thus, in bronchocele or goiter, we have an example of a poison acting only on the thyroid gland, while in whooping-cough and hydrophobia all the organs supplied by the pneumogastric nerves (q.v.) are affected, and, in paludal or malarial poison most of the organs. (2.) Morbid poisons, like medicines and ordinary poisons, have their period of latency, which, however, here is usually much prolonged. While a medicine, e.g., is seldom longer than a few hours in exhibiting its effects, the poisons of scarlatina, measles, and small-pox remain latent in the system for at least seven, ten, and sixteen days respectively; while that of paludal fever and hydrophobia may be dormant for a year or upward. (3.) When several tissues or organs are acted on, the actions may be simultaneous, but are more commonly consecutive, a considerable interval often elapsing between the attacks. (4.) Another law of morbid poisons is, that two may co-exist in the same person; for example, small-pox and cow-pox have often been seen at the same time in the same person. In this case, each disease runs its course unaffected by the other; but most commonly, when two co-exist, one lies latent while the other runs its course. Thus, a case of intermittent fever may suddenly subside, and small pox make its appearance; on recovery from this disease the intermittent fever may return.

Among the peculiarities presented by morbid poisons, the following points must be noticed: (1.) In experiments made on the inoculation of the small-pox virus by Dr. Fordyce, it was found that extremely diluted poison, if it acted at all, produced the same effects when introduced into the system as the concentrated virus. Hence it may be inferred that the intensity of the disease is not proportional to the amount of virus received into the system. (2.) Women in child-bed may not only engender a special poison of this class—that of puerperal fever—but are highly susceptible of these poisons, and almost always succumb to their action. (3.) Another peculiar law of morbid poisons, and one wholly unknown in medicinal substances, is, as Dr. Aitken remarks, "the faculty which the human body possesses of generating to an enormous extent a poison of the same nature as that by which the disease was originally produced. A quantity of small-pox matter not so big as a pin's head will produce many thousand pustules, each containing fifty times as much pestilential matter as was originally inserted; and the miasmata secreted by one child laboring under whooping-cough are sufficient to infect a whole city." A remarkable illustration of the development of syphilitic poison from a single infant over a whole province is given in the article **SYPHILIS**. (4.) A still more remarkable fact is, that many of these morbid poisons possess the property of never occurring more than once in the life of the same individual. This is the case with scarlatina, measles, small-pox, whooping-cough, and (to a less extent) typhoid and typhus fevers. (5.) This class of poisons is powerfully influenced by climate, and probably by the nature of the soil. Thus, the severe forms of typhus so common in this country are hardly known in warmer climates, and the influence of cold weather on cholera and plague are well known.—For further information on this subject, the reader is referred to Dr. Robert Williams' *On Morbid Poisons*; and to the chapter on zymotic diseases, in the first volume of Aitken's *Science and Practice of Medicine*, from which we have drawn most of the preceding remarks.

VISCHER, FRIEDRICH THEODOR, b. Germany, 1807; educated at Tübingen, where he studied theology. He soon devoted himself to aesthetics and philosophy, and after travels in Italy and Greece, became prof. of aesthetics at Tübingen in 1844, and has remained there with the exception of the years 1855-66, when he lived in Zürich. His principal book is his *Ästhetik* (1848-58).

VISCONTI, a Lombard family which rose to sovereign rank in northern Italy in the 13th c., and was equally distinguished by the share it took in the political contests of the middle ages, and by the services which it rendered to literature and science. The name Visconti is derived from the Latin *vicescomites*, and at first was merely the title of an office, but it gradually became a family surname, though when it came to be applied to this family authentic history fails to explain. The family descended, according to tradition, from Desiderius, the last king of the Lombards, and belonged to the feudal nobility of northern Lombardy, having large estates near lakes Como and Maggiore. The first who appears prominently in history is OTTONE, who became, in 1078, viscount of the archbishopric of Milan. The great Lombard families having, in course of time, split up into a multitude of lines, each in possession of a petty sovereignty, the Visconti on this account rose into comparative importance, more especially when, in 1262, another OTTONE was appointed archbishop of Milan by pope Urban IV. This appointment being considered by the people an infringement of the rights of the chapter, was opposed by them; and their leader, Martino della Torre, and his successors, kept possession of the property of the see, and forced the archbishop to exile himself for 15 years. At last, the exiled Ottone advanced at the head of a body of exiles and emigrants upon Milan, defeated and captured his rival in a bloody and desperate conflict near Desio (Jan. 21, 1277), and entered the city amid the acclamations of the people, who hailed him as archbishop and perpetual lord of Milan. But he was not permitted to enjoy his newly-acquired dignities undisturbed, for, during the eleven years of his temporal sovereignty, he was engaged in almost uninterrupted warfare with the Torriani; and the contest was continued by his grand-nephew MATTEO, who was chosen "captain of the people" in 1288. Ottone continuing in the archbishopric till his death in 1295. Matteo proved himself a prudent and temperate ruler, and his influential position was recognized by the emperor Adolf, who created him imperial vicar in Lombardy. Expelled by the Torriani and their allies in 1302, he was restored in 1311 by the aid of the emperor Henry VII., and reappointed imperial vicar in consideration of the payment of 40,000 florins; and Pavia, Alessandria, Tortona, Cremona, Bergamo, Lodi, etc., having been forced to acknowledge his authority, the family became more powerful than ever. Unfortunately, however, a quarrel arose with pope John XXII. regarding the appointment to the Milan archiepiscopate; and Matteo, obstinately refusing to yield to the papal pretensions, was condemned as a confirmed heretic, and himself and his descendants stigmatized as perpetually infamous (Mar. 14, 1322). The people, despite their profound esteem and affection for their ruler, were horror-struck at this solemn denunciation; and the feeling that so many of his friends were falling away from him so preyed on Matteo's mind, that he died in June, 1322, three months after his excommunication. His son, GALEAZZO I., was chosen his successor, and immediately the pope proclaimed a religious crusade against the heretical Visconti, and the "holy army" under Raymond of Cardona advanced in 1323, on Milan, committing the most horrible ravages during its march. But though the Visconti could not directly oppose such an overwhelming force, Galeazzo's brother Marco, an able and experienced warrior, hovered round the disorderly host, cutting off detached parties; and the emperor Lewis (of Bavaria) having sent a body of troops to aid the Visconti, the crusaders were driven back, totally defeated at Vavrio on the Adda (1324), and the remnant, with their leader Cardona, captured. Soon after, Galeazzo, by the intrigues of his ambitious brother Marco, was perpetually exiled, yet his eldest son, Azzo V., succeeded him, while pope Nicolas confirmed the third son, Giovanni, in the archiepiscopate—events which led pope John XXII., for the sake of maintaining some authority over Milan, to recall the excommunication he had pronounced against the Visconti. Azzo was the greatest prince of the race, and ruled Milan wisely and well; devoting his attention to the improvement and embellishment of the city, in which labor he was aided by the painter Giotto (q.v.) from Florence, and the sculptor Balducci from Pisa. As great in war as in peace, he extended his sway over almost the whole of Lombardy; and on his death in Aug., 1339, 3,000 citizens of Milan voluntarily assumed the garb of mourning. The council-general of Milan elected his two uncles, the archbishop GIOVANNI and LUCCHINO, as joint rulers in his stead; and on the latter, who was an able, resolute, and unscrupulous prince, wholly devolved the cares of the temporal sovereignty. Under his sway, Montferrat was added to the dominions of the Visconti; Pisa became tributary; a regular police was established; all offenders were punished with impartial severity; and a summary judgship of appeals (*cognator*), open only to foreigners to prevent party bias, was established. But the vices of suspicion, lust, and revenge threw a deep gloom over Lucchino's eminent qualities, led him into the commission of many cruel and tyrannical acts, and indirectly caused his own death by poison in Jan., 1349. From this time, the mild and peaceful archbishop reigned alone, availing himself of the assistance of his nephews in the more arduous tasks of government. He purchased Bologna for 200,000 florins in

1350; in 1353 accepted the lordship of Genoa, which had been almost crushed by its rival, Venice; and taking up the quarrel of his new subjects, equipped a fleet which, under Paganino Doria, gained a complete victory over the Venetians. He was the generous patron and friend of Petrarch, and the last good prince of the Visconti family. His three nephews conjointly succeeded him in Oct., 1354; but in 1355 the eldest had died of poison, and his dominions were shared between the other two, GALEAZZO and BARNABO. Both princes were men of pre-eminent ability, but irreclaimably vicious, the latter being a very monster of cruelty. Bologna, which belonged to Barnabo, fell into the hands of the pope, who excommunicated Barnabo for attempting to recover it; but the Visconti prince laughed at the holy father's curse, and swore that he would be both pope and emperor in his own dominions. Innocent VI. then sent legates to him to propose terms, but the young savage compelled the unfortunate messengers to tear their master's bulls to fragments, and swallow them piece by piece. One of the legates, on becoming pope as Urban V., took revenge by proclaiming a crusade against Barnabo, which was joined by all the principal Italian princes; the Romagna and the borders of Lombardy were desolated by a long desultory strife; and though Barnabo was ultimately forced to accept a sum of money in place of Bologna, he took a humorous revenge on his ecclesiastical antagonists by compelling the clergy in his dominions to pay all the expenses of the war. One act of his, however, may be mentioned with commendation; he issued an edict forbidding even the mention of the names of "Guelf" and "Ghibelline" under pain of having the tongue cut out; and his well-known stern adherence to such promises put an end to this long and mischievous controversy. His brother Galeazzo, who had established his residence at Pavia, was the "Mæcenæ" of his time; he steadily befriended Petrarch; founded, under his direction, the university of Pavia; and collected a considerable library. The invention known as "Galeazzo's lent," a system of torture calculated to prolong the victim's life for 40 days, stamps him with the family character of cruelty. On Galeazzo's death, his son, GIAN-GALEAZZO, succeeded (1378) him in Pavia and its dependencies; and by treacherously seizing and imprisoning his uncle, Barnabo of Milan, became sole ruler of Lombardy. He had all the great qualities and most of the vices of his race, and openly aspired to the sovereignty of Italy; conquering Padua, Verona, Vicenza; extending his dominions to the gates of Florence, which he also attacked; and purchasing from the emperor Wenceslas the absolute sovereignty of his dominions; with the title of *duke of Milan*, for 100,000 gold florins. This curtailment of the empire, however, displeased Germany, but the palatine Ruprecht, who invaded Lombardy, received such a lesson from the condottieri of Alberico da Barbiano at Brescia as caused him to gladly seek the n. side of the Alps. Florence, the only remaining obstacle to the accomplishment of the ambitious Visconti's scheme, was on the point of surrendering, when Gian died of the plague in 1402. He was a great patron of letters and science, gathered eminent men of all classes around him, reorganized the university of Piacenza, established a magnificent library, constructed the famous bridge over the Ticino at Pavia, and commenced the erection of the cathedral of Milan. His daughter, Valentina, married Louis, the younger brother of Charles VI. of France, and became grandmother of Louis XII., who upon this relationship founded his claims to the Milanese. His sons, GIAMMARIA VISCONTI (Giovanni-Maria) and FILIPPO MARIA VISCONTI, reigned in succession; but the former, who was cowardly, suspicious, and of a cruelty partaking of insanity, was, in the interest of his subjects, stabbed to death, May 16, 1412; and the younger brother, equally timorous and suspicious, and of only average cruelty, became sole ruler. The Venetians on the e., the marquis of Monferrat on the w., and the pope on the s., were rapidly curtailing his dominions, when, by a happy stroke of policy, he espoused Beatrice di Tenda, the widow of a condottieri leader, and thus obtained the services of a veteran band of soldiers. His fortunate choice of Carmagnola (q.v.) as his general led to the restoration of the former boundary line of his dominions; and on his quarrel with the soldier who had served him so well, he was sagacious enough to supply his place by others as nearly equal in ability as could be obtained. In 1441 he engaged the services of Francesco Sforza, to whom he gave his natural daughter Bianca in marriage; and on his death in 1447, the Visconti family was succeeded by that of Sforza (q.v.) in the lordship of the Milanese. Collateral branches of the Visconti still exist in Lombardy. See Lilla's *Famiglie Celebri Italiane*, Verri's *Storia di Milano*, and Muratori's *Annali de Italia*.

VISCONTI. a family of archæologists and architects, the first of whom to rise to prominence was GIOVANNI BATTISTA VISCONTI, a native of Sarzana, who settled at Rome, and, after making for himself a great name as an archæologist, succeeded Wincklemann as prefect of the antiquities of Rome. He was employed by Clement XIV. and Pius VI. to collect works of ancient art for the museum of the Vatican ("Museo Pio Clementino," as, from its two principal benefactors, it was called); and afterward, in 1778, commenced the writing of the letter-press which was intended to accompany the series of engravings of that splendid collection. He died in 1784.—ENNIO-QUIRINO VISCONTI, eldest son of the former, was born at Rome, Nov. 1, 1751, and was educated by his father, who intended him for the church. This profession, however, he afterward refused to adopt, and was for a time disowned by his father. But at last, in 1778, the old man was glad to call his

son to his aid, and together they prepared the first volume of the engravings of the *Museo Pio Clementino*. In 1784 he edited alone the second volume of the same series; he was also appointed conservator of the Capitoline museum. The series of engravings of the *Museo* was regularly issued, the seventh and last volume being published in 1807. When Rome fell into the hands of the French, Visconti became a member of the provisional government, and afterward one of the five consuls; but in Nov., 1799, the arrival of the Neapolitan army forced him to emigrate to France, and from this time he settled at Paris. His great reputation as an archaeologist having been long recognized among the learned men of the French capital, he was made an administrator of the Louvre, and professor of archaeology; and drew up a catalogue of the works of art in the new museum (many of the items being his old familiar acquaintances of the Vatican) which from the frequent raids of Napoleon on foreign collections, required to be frequently re-edited and enlarged. In 1804 he was requested by the emperor to select and publish a series of portraits of the distinguished men of ancient Greece and Rome; and this, probably the greatest of his works, appeared in two parts, *Iconographie Grecque* (3 vols. 4to, 1808) and *Iconographie Romaine* (1 vol. 4to, 1817). Contemporaneously, Visconti issued from time to time papers and dissertations on particular objects of ancient art. In 1815 he came to London by express desire of the British government, to fix a fair price for the Elgin marbles (q.v.), and on his return wrote a memoir explanatory of these sculptures. His last work was to complete his *Illustrazioni di Monumenti scelti Borghesiani* (Rome, 1821). He died after a long illness, Feb., 1818, and his death was a source of grief to the learned throughout Europe, many of whom came from great distances to attend his funeral. Besides his immense antiquarian knowledge, Visconti possessed an extensive acquaintance with the history, languages, mythology, and manners of the classic age. A complete collection of his works was commenced at Milan in 1818, but has not been completed. See *Antologia* of Florence, No. 18; Tipaldo's *Biografia degli Italiani Illustri*; and Maffei's *Storia della Letteratura Italiana*.—His younger brother, FILIPPO AURELIO, was also an eminent archaeologist, and was president of the commission of antiquities and fine arts at Rome from 1809 to 1814. He edited the *Museo Chiaramonti*, a sequel to the *Museo Pio Clementino*, and published several other works; but his chief attention was bestowed upon numismatology. He died at Rome in 1830.—LOUISE JOACHIM VISCONTI, the son of Ennio Quirino, was born at Rome in 1797, and after a careful education at Paris, was apprenticed to an architect. His progress in his profession was rapid, as he was appointed an inspector of public buildings as soon as his apprenticeship had expired, and shortly afterward became one of the architects and surveyors of Paris, and architect of the Bibliothèque Royale in 1825. His works include various public monuments in honor of eminent Frenchmen, some of the first fountains of Paris, the tomb of Napoleon I., and various hotels and private residences, the chief of all being the plans for the completion of the Louvre on a most magnificent scale. Visconti died at Paris, Dec. 29, 1853.—The nephew of the preceding, PIERRE-HERCULES VISCONTI, is a celebrated archaeologist and professor of archaeology in the national academy of France, at Rome.

VISCOSITE, a name given by professor Henry Wurtz to one of the constituents of the mineral *grahamite*. (See *IRISITE*.) Viscosite forms from 15 to 30 per cent of this mineral, and also exists in some of the rock oil of Pennsylvania. It is obtained by digesting grahamite with ether or mineral naphtha, and distilling off the solvents. It is a translucent, dark brown, lustrous substance, having a peculiar balsamic odor, and being very brittle when cold. When warmed it acquires a viscosity like healing wax, and is very ductile. It appears to be a hydrocarbon free from oxygen.

VISCOUNT (Lat. *vices*, in place of, and *comes*, earl), originally the officer who acted as deputy to the earl, the earl being the king's immediate officer within his county. When the title of earl, originally personal, became hereditary, which took place in England under William the conqueror, a deputy had necessarily to be appointed in all cases where he was a minor, or otherwise incapacitated from discharging the duties of his office. This deputy gradually became a permanent officer, otherwise known as the sheriff, whose Latin designation continued to be *vicescomes*. The hereditary title of viscount is a degree of nobility unconnected with office. It was first granted in England to John Beaumont, created a peer by the title of viscount Beaumont in 1440. A viscount is now the fourth degree of nobility in the United Kingdom. His coronet consists of a chased circlet of gold, round which are ranged an indefinite number of pearls, nine of them being most generally shown, smaller than those of a baron's coronet, and in contact with each other. The mantle is scarlet, and has two doublings and a half of ermine. A viscount is styled "right honorable;" his wife is a viscountess; his eldest son has no courtesy title of peerage, but all his sons and daughters are styled "honorable."

VISCUM. See MISTLETOE.

WISE (*escalier à vis*), a spiral or corkscrew staircase, the steps of which wind round and rest on a perpendicular pillar, called the newel (q.v.). In the Norman style, the steps rested on a spiral arch; but in later times, the steps were formed of single stones, stretching from the newel to the wall. This kind of staircase was that most generally used in mediæval buildings.

WISEU, an episcopal city of Portugal, in the province of Beira, stands in a wide, fruit-producing plain, at the height of 1300 ft. above sea-level, 50 m. n.e. of Coimbra. Its cathedral is a striking flamboyant edifice, and contains a number of excellent pictures by Gran Vasco, the Portuguese Fra Angelico. In the vicinity is the Roman camp, called Cava de Viriato. The town, which is one of the oldest in the country, contains other Roman as well as Gothic and Moorish remains. A large fair is held here. Pop. 9,160.

VISHNI-VOLOTCHEK, a t. of Russia, in the government of Tver, about 230 m. s.e. of St. Petersburg by railway. It is situated on the Tzna, on the Vishni-Volotchek water-route constructed by Peter the great, and connecting the navigation of the Baltic and Caspian seas, by means of the Volga, etc. There is a very extensive transit-trade. An immense quantity of corn passes through the town every year. Pop. '67, 15,133.

VISHN'U is the second god of the Hindu triad, but is considered by his worshippers to be the supreme deity of the Hindu pantheon. See TRIMŪRTI and VAISHN'AVAS. The word is derived, by *S'āṅkara* (q.v.), in his commentary on the thousand names of Vishnu, and by other commentators after him, from *viśh*, encompass, or *vis*, penetrate; when, according to them, it would imply the deity who encompasses or penetrates the whole universe, both as regards its exterior appearance and its inward essence. A similar etymology is assigned to the word by *Yāska* (q.v.) in his gloss on the R̥gveda; but as in this Veda, Vishnu does not yet embody the notions connected with him at the epic and Purāṇic period of Hinduism (see INDIA, sec. Religion), Yāska does not impart to the name the implied sense given to it by the commentators just mentioned. In the R̥gveda, Vishnu is a representation of the sun, who "strides through the seven regions of the earth," and "in three ways plants his step" (or, as Yāska explains, plants his steps so as to become threefold). And, according to one predecessor of Yāska, these three steps mean the manifestation of the sun at its place of rising, on the meridian, and at its place of setting; or, according to another, its manifestation on earth, in the intermediate space, and in heaven; when—as a later commentator observes—in the first of these manifestations, Vishnu represents fire; in the second, lightning; and in the third, the solar light. From this position which Vishnu holds in the R̥gveda (see VEDA), it results that he was not regarded there as supreme, or even as equal, to other deities, who, at the Vedic period, occupied a foremost rank. He is extolled in several hymns as having "established the heavens and the earth," as "being beyond mortal comprehension," and so forth; but he is there also described as having derived his power of striding over the world from *Indra* (q.v.), and as celebrating the praises of this god. He is frequently invoked together with the latter, but apparently always as inferior to him; and often, too, he occurs in company with a number of other gods, such as Varuṇ'a, the Maruts, Rudra, Vāyu, the luminous deities called *Adityas*, and others, without any distinction being drawn in their respective rank. Fewer hymns, moreover, are separately devoted to his praise than to that of Agni, Indra, or other prominent gods of the Vedic period; and it deserves notice, too, that at that period he was not yet included among the *Adityas*, for only at the epic period, when the number of these deities, originally varying from six to eight, was raised to twelve, Vishnu was included in it—he then being named as the foremost of these luminous offsprings of Aditi, or space.

Although some of the Brāhman'as of the Vedas (q.v.) already show the progress which the solar Vishn'u had made in the imagination of the people, and although they contain the germ of several legends, which, at a later time, became fully developed, the really mythological character of this god, as the basis of the divine worship now paid him by a large class of the Hindu population, belongs to the epic poems—the *Rāmāyan'a* and *Mahābhārata* (q.v.)—and to the *Purāṇ'as* (q.v.). In the *Mahābhārata*, Vishn'u is often identified with the supreme spirit; but while in some portions of this poem—the different parts of which belong to different epochs of Hindu antiquity—he is thus regarded as the most exalted deity; he is again, in others, represented as paying homage to S'iva (q.v.), the third person of the Trimūrti, and as acknowledging the superiority of this god over himself. Taking, therefore, the *Mahābhārata* as a whole, he does not occupy, in this epos, the exclusive supremacy which is assigned to him in the *Rāmāyan'a*, and still more in those *Purāṇ'as* especially devoted to his praise.

The large circle of myths relating to Vishn'u, in the epic poems and *Purāṇ'as*, is distinguished by a feature which, though not quite absent from the mythological history of S'iva, especially characterizes that of Vishn'u. It arose from the idea, that whenever a great disorder, physical or moral, disturbed the world, Vishn'u descended "in a small portion of his essence" to set it right, to restore the law, and thus to preserve creation. Such descents of the god are called his *Avatāras* (from *ava* and *tr'i*, descend); and they consist in Vishn'u's being supposed to have either assumed the form of some wonderful animal or superhuman being, or to have been born of human parents, in a human form, always, of course, possessed of miraculous properties. Some of these *Avatāras* are of an entirely cosmical character; others, however, are probably based on historical events, the leading personage of which was gradually endowed with divine attributes, until he was regarded as the incarnation of the deity itself. With the exception of the last, all these *Avatāras* belong to the past; the last, however, is yet to come. Their number is generally given as ten, and their names in the following order: 1. The fish; 2. The tortoise; 3. The boar; 4. The man-lion; 5. The dwarf; 6. The Paras'u-Rāma;

7. The Rāmachandra, or, briefly, Rāma-; 8. The Kr'ishn'a and Balarāma-; 9. The Buddha-; and 10. The Kalki- or Kalkin-Avatāra. This number and enumeration of Avatāras, however, was not at all times the same. The Mahābhārata, though also mentioning ten names, successively the Hansa-, tortoise-, fish-, boar-, man-lion-, dwarf-, Paras'u-Rāma-, Rāma-, Sātva-, and Kalkin-Avatāras. The Bhāgavata-Purāṇa speaks twenty-two Avatāras of Vishn'u, which, for instance, also comprise Pr'ithu (q.v.), of Dhanvantari, the god of medicine, and Kapila, the reputed founder of the Sāṅkhya (q.v.) philosophy. Other works have twenty-four Avatāras, or even call them numberless; but the generally-received Avatāras are those ten mentioned before, an idea of which may be afforded by the following brief account.

1. The *Matsya-* or *fish-Avatāra*.—When, at the end of the last mundane age, the Bhāgavata-Purāṇa relates, Brahman, the first god of the Trimūrti, had fallen asleep, a powerful demon, *Haya-grīva*, stole the Vedas which had issued from the mouth of Brahman, and lay by his side. About that time, a royal saint, *Satyavrata*, had by his penance attained the rank of a Manu, and Vishn'u, who had witnessed the deed of Haya-grīva, and intended to slay him, assumed for this purpose the form of a very small fish, and glided into the hands of the saint when the latter made his daily ablutions in the river. Manu, about to release the little fish, was addressed and asked by it not to expose it to the danger that might arise to it from the larger fish in the river, but to place it in his water-jar. The saint complied with its wish; but in one night the fish grew so large, that at its request he had to transfer it to a pond. Yet soon the pond also becoming insufficient to contain the fish, Manu had to choose a larger pond for its abode; and, after successive other changes, he took it to the ocean. Satyavrata now understood that the fish was no other than *Nirāyaṇ'a* or Vishn'u, and, after he had paid his adoration to the god, the latter revealed to him the imminence of a deluge which would destroy the world, and told him that a large vessel would appear to him, in which he was to embark together with the seven Rishis, taking with him all the plants and all the seeds of created things. Manu obeyed the behest of the god; and when the water covered the surface of the earth Vishn'u again appeared to him in the shape of a golden fish with a single horn, 10,000 miles long; and to this horn Manu attached the vessel, by means of Vishn'u's serpent serving as a cord. While thus floating in the vessel, Manu was instructed by the fish-god in the philosophical doctrines and the science of the supreme spirit; and after the deluge had subsided, the fish-god killed Haya-grīva, restored the Vedas to Brahman, and taught them to the Manu Satyavrata, who in the present mundane age was born under the name of *S'riddhadeva*, as the son of Vivasvat.—A fuller account of this Avatāra is given in the *Matsya-Purāṇ'a*, where the instruction imparted to Manu by the fish-god includes all the usual detail contained in a Purāṇ'a (q.v.), that relating to creation, the patriarchs, progenitors, regal dynasties, the duties of the different orders, and so forth. In the Mahābhārata, where the same legend occurs, but without either that portion concerning Haya-grīva, or the instruction imparted by the fish, there is, besides minor variations, that important difference between its story and that of the Purāṇas, that the fish is not a personification of Vishn'u, but of Brahman, and that the deluge occurs in the present mundane age, under the reign itself of the Manu, who is the son of Vivasvat.—The origin of this Avatāra is probably a kindred legend, which occurs in the *Satupathabrahmaṇ'a*, of the White Yajurveda (see VEDA); but there the fish does not represent any special deity, and the purpose of the legend itself is merely to account for the performance of certain sacrificial ceremonies.

2. The *Kārma-* or *tortoise-Avatāra*.—When, of old, the gods felt their powers impaired, and were desirous of obtaining *Amr'ita* the beverage of immortality, Vishn'u directed them to churn, together with the demons, the milk-sea, by taking the mountain *Mandara* for their staff, and his serpent *Vāsuki* for their cord, the gods to stand at the tail, and the demons at the head of the serpent; while he himself consented to support the mountain on his back, after having assumed the shape of a gigantic tortoise. The result of this churning of the sea of milk, was, besides the ultimate recovery of the *Amr'ita*, the appearance of a variety of miraculous things and beings; but it also led to a violent contest between the gods and demons, in which the latter were defeated. See RĀM.—The idea of the lord of creation assuming the shape of a tortoise, and that of sacrificial liquids, especially clarified butter, becoming tortoise-shaped (*Kārma*, the word for tortoise, meaning literally, “badly or slowly going”), occurs also in the Yajurveda; but the legend on which the tortoise-Avatāra of Vishn'u is based seems to belong entirely to the post-Vedic period of Hinduism.

3. The *Varāha-* or *boar-Avatāra*.—It is supposed to have taken place when, at the period of creation, the earth was immersed in water, and Vishn'u, in order to raise it up, assumed the form of a gigantic boar. In the earlier recension of the *Rāmāyaṇ'a* and the *Linga-Purāṇ'a*, it was Brahman, the creator of the universe, who transformed himself into a boar for rescuing the earth from its imperiled position; and in the *Black Yajurveda*, where this idea is first met with, it is likewise said that the lord of creation upheld the earth, assuming the form of a boar. At a later period, however, this Avatāra is generally attributed to Vishn'u. Between both conceptions there is, however, also this great difference, that in the former the transformation of the deity into a boar has apparently a purely cosmical character, whereas in the latter “it allegorically represents the extrication of the world from a deluge of iniquity, by the rites of religion.”

(Wilson's translation of the *Vishn'u-Purân'a*, 2d ed., by F. Hall, vol. i. p. 59, note.) For the boar, as an incarnation of Vishn'u, is the type of the ritual of the Vedas. He is described as the sacrifice personified; his feet being the Vedas; his tusks, the sacrificial post to which the victim is tied; his teeth, the sacrificial offerings; his mouth, the altar; his tongue, the fire; his hairs, the sacrificial grass; his eyes, day and night; his head, the place of Brahman; his mane, the hymns of the Vedas; his nostrils, all the oblations; his snout, the ladle of oblation; his voice, the chanting of the Sāmaveda; his body, the hall of sacrifice; his joints, the different ceremonies; and his ears as having the properties of voluntary and obligatory rites (*Vishn'u-P.*, vol. i. p. 63); and similar descriptions of the boar occur in the Harivan's'a (q.v.) and elsewhere; besides those relating to the immense size and wonderful appearance of the mysterious animal. In the *Bhâgavata-Purân'a*, another legend is also connected with this incarnation of Vishn'u, still more distinctly proving that at the Purân'ic period, it was viewed in a purely religious light. According to this legend, *Jaya* and *Vijaya*, two doorkeepers of Vishn'u, once offended some Munis who claimed admission to the paradise of Vishn'u, and in consequence were doomed to lose their position in Vishn'u's heaven, and to be reborn on earth. They became thus the sons of *Kasyapa* and *Diti*, under the names of *Hiran'yakas'ipu* and *Hiran'yaksha*. The former subdued the three worlds, and the latter went straight to heaven, to conquer also the gods. Thus threatened in their existence, the gods implored the assistance of Vishn'u; and Vishn'u, who at that period was the mysterious or primitive boar, slew Hiran'yaksha. A similar contest between Vishn'u as boar and numerous demons, the progeny of Diti, always ending in the defeat of the latter, is also described in the *Mokshadharma*, one of the later portions of the Mahâbhârata; and from this and similar descriptions, it follows that the boar-Avatâra had gradually lost its original character, and assumed that common to the remaining Avatâras, of representing the deity as become incarnate, for the purpose of remedying moral or religious wrong, or of destroying influences hostile to the pretensions of the Brâhmanic caste.

4. The *Nr'sinha*- or *man-lion-Avatâra*.—*Hiran'yakas'ipu*, the brother of the demon Hiran'yaksha just mentioned, had resolved to become a sovereign of the three worlds, and exempt from death and decay. To attain this end, he practiced severe austerities, and ultimately received from Brahman, as the desired reward, a promise that he should become a supreme ruler, and death should not accrue to him from any created being, neither within his abode nor without, neither by day nor by night, neither in heaven nor on earth, nor by any kind of weapon. Possessed of the grant of this boon, he now gave course to the hatred he had conceived against Vishn'u for having killed his brother Hiran'yaksha. He oppressed all the gods, robbed them of their shares in the sacrifices, and threatened their destruction. But he had a son, *Prahlâda* or *Prahlâda*, who, through his religious studies and pious conduct, had become a devout worshiper of Vishn'u. When Hiran'yakas'ipu became aware of his son's partiality for this god, he first endeavored to impart to him his own hostile feelings against Vishn'u, but failing in this, resolved to kill him. All the means, however, he employed to this end remained vain; and when at last, Hiran'yakas'ipu, about to cut off the head of his son, sneeringly asked him why Vishn'u, who, as he asserted, was everywhere, should not be present also in a pillar in the hall, which he struck with his fist, Vishn'u suddenly made his appearance in the shape of a being neither man nor animal, in that of a man-lion of fearful aspect and size; and after a violent struggle with the demon, killed him in tearing his heart out with his finger-nails. Prahlâda was then installed by him as sovereign over the demons, and at the end of a pious reign, obtained final liberation.

5. The *Vâmana*- or *dwarf-Avatâra*.—Prahlâda's son was *Virochana*, and his son was *Bali*. The latter, after having conquered Indra (q.v.), ruled over the three worlds, and filled the gods with dismay for their future prosperity. They had, in consequence, recourse to Vishn'u; and when, at one time, Bali was celebrating a grand sacrifice, Vishn'u, assuming the shape of a dwarf, humbly approached the demon king. Pleased with the devout and unpretending appearance of the little Brâhman, Bali asked him to demand a boon, however costly it might be. The dwarf, however, merely asked for so much ground as he could measure with three paces. The king smilingly granted so modest a request, though his family priest *Usanas*, suspecting the true nature of the dwarf, strongly dissuaded him from doing so. But when the dwarf had obtained what he asked for, he strode with one pace over the earth, with a second over the intermediate space (the atmosphere), and with a third over the sky, thus leaving for Bali only the subterranean regions, which he assigned him for his future abode. The demons endeavored to frustrate this result, after Vishn'u had taken his first two strides, but they were overcome by the followers of Vishn'u; and Bali, when resigning himself to his fate, in reply to a reproach addressed to him by the dwarf for trying to break his promise, uttered—according to the *Bhâgavata-Purân'a*—the following words, which may serve as one of many instances to show how sacred a promise was held by the Hindus when once given, and even though artfully obtained: "If, renowned chief of the gods, you consider the word which I uttered to be deceitful, I now do what is sincere, and can be no deception—place your third step on my head. Fallen from my position, I fear not the infernal regions, or binding in bonds, or misfortune difficult to escape, or loss of wealth, or your restraint, so much as I am

afflicted by a bad name." (See J. Muir's *Original Sanskrit Texts*, vol. iv. p. 128.) For his righteousness, he was then rewarded by Vishn'u with the promise, that after a temporary residence in one of the most delightful places of Pâtâla (q.v.), he should be born as the Indra, in the reign of the eighth Manu. In this incarnation as dwarf, Vishn'u is considered to have been a son of the same Kas'yapa who is also the father of Hiran'yakas'ipu and Hiran'yāksha; but while their mother is Diti, the dwarf's mother is Aditi (space); and since she previously had brought forth Indra, Vishn'u is sometimes called Upendra, or the younger or later Indra. As a son of Aditi, Vishn'u becomes one of the Adityas (see before).—The Vedic conception of the three strides of Vishn'u, as mentioned in the beginning of this article, is doubtless the basis of the idea whence this Avatâra arose.

6. The *Paras'u-Râma-Avatâra*, or Vishnu's incarnation as Râma, the son of Jamadagni, armed with an axe (*paras'u*). Arjuna, a son of *Kr'tavîrya*, and king of the Haihayas, had obtained, as a reward for his piety, a thousand arms, and the sovereignty over the earth. The gods, frightened at his power, had recourse to Vishn'u, and the latter resolved to be born as a son of Jamadagni, that he might slay him. Jamadagni was the son of *R'ichika*, of the race of Bhr'igu, a pious sage who had married *Ren'ukâ*, the daughter of king *Prasenajit*, and had obtained five sons by her, the last of whom was *Râma*, or Vishn'u incarnate in this form. *Ren'ukâ* having once, for some supposed impropriety, incurred the anger of her husband, was, at his bidding, killed by her son Râma, but at the request of the latter, again restored to life; and her first four sons were likewise saved from the consequence of the wrath of Jamadagni by the intercession of their brother Râma. After this event had happened, or, as one account goes, previously to it, Arjuna came to the hermitage of Jamadagni, and was there hospitably received by the saint, who could treat him and his followers sumptuously, as he possessed a fabulous cow of plenty, that not merely supplied him with the milk and butter required for his sacrificial offerings, but with everything else he wished for. Struck by the precious qualities of this cow, and in spite of the kind treatment he had met with, Arjuna carried off with him the cow and her calf. When Râma, who, on this occasion, had been absent from home, returned to the hermitage, and learned what had happened, he took up his axe (or, as the *Mahâbhârata* says, his bow), and slew Arjuna, together with his army. The sons of the latter, to revenge their father's death, after some time, attacked the hermitage, and succeeded in killing Jamadagni. Thereupon, Râma made a vow to extirpate the whole Kshatriya or military race; and not satisfied with destroying the sons of Arjuna, he killed every Kshatriya whom he encountered afterward. In this manner, the legend concludes, "he cleared thrice seven times the earth of the Kshatriya caste"—killing the men of so many generations as fast as they grew to adolescence—"and filled with their blood the five large lakes of Samantapanchaka, from which he offered libations to the race of Bhr'igu." He then performed a solemn sacrifice, and distributed the land and many riches among the ministering priests. The *Mahâbhârata*, which on two occasions relates this legend, in one place enumerates the Kshatriyas who escaped the destruction of their caste, and from whom the lines of the kings hereafter were continued; this account, however, is inconsistent with Purânîc lists, in which the royal lineages are uninterrupted. There can be little doubt that a real historical conflict between the Brâhman'as and Kshatriyas underlies the conception of this Avatâra; one which has its parallel in the history of Vasist'ha and Vis'vâmitra (q.v.).

7. The *Râmachandra*- or, briefly, *Râma-Avatâra*.—*Râvan'a*, a king of *Lankâ*, or Ceylon, a monster with ten heads and twenty arms, had, by dint of austerities, obtained from Brahman the promise that neither gods nor demons should be able to take his life. In consequence, he oppressed the whole universe: the sun dared not shine hot, or the fire burn, or the wind blow, where he stood, and the ocean, when it saw him, became motionless. The gods, thus seeing the world and their own existence endangered, implored Brahman to protect them; and he, remembering that the demon, when asking for the boon he had granted him, omitting to include men among the beings that should not hurt him, advised the gods to pray to Vishn'u to become incarnate. This they did, and Vishn'u granted their prayer. At that time, *Das'aratha*, a king of *Avodhyâ*, of the solar line of Hindu kings, performed the great horse-sacrifice in order to obtain sons; for though he had three wives, *Kaus'alyâ*, *Sumitrâ*, and *Kaikeyî*, he was without male progeny. This sacrifice became successful, for, when on the point of completion, a supernatural being appeared to him with a divine beverage, one-half of which he was to give to Kaus'alyâ, one-fourth to Sumitrâ, and the remaining fourth to Kaikeyî. And as this nectar which he gave them contained the divine essence of Vishn'u, *Râma*, the son whom Kaus'alyâ brought forth, became one-half, the twins *Lakshman'a*, and *Satruggha*, born by Sumitrâ, together one-fourth, and *Bharata*, the son of Kaikeyî, another fourth, of the substance of Vishn'u. While Râma and his brothers were still boys, the sage *Vêd'râmitra* (q.v.) came to the court of Das'aratha, requesting him that he should allow Râma to proceed to his hermitage, in order to destroy there the Râkshasas, or fiends, who infested it, and disturbed his sacrificial rites. Though reluctantly, Das'aratha gave his consent to his departure; and Râma accompanied by his brother Lakshman'a—who, throughout his brother's career, remained his faithful companion and ally—started on his first eventful journey; for it was marked by a number of won-

derful exploits which he performed in killing the demons and which already then revealed his divine mission. Having fulfilled the desire of Visvāmītra, he proceeded to Mithilā, where king *Janaka* held a great assembly of kings, having promised to give in marriage his daughter *Sītā* (q.v.) to the prince who would be able to bend the bow with which *S'iva* (q.v.) once conquered the gods at the sacrifice of *Daksha*, and which now was in his trust. Yet so large and heavy was this bow, that not even the strongest of them could so much as move it. But when *Rāma* arrived, and the bow was shown him, he lifted it up and bent it, as it were in sport, and ultimately even broke it in the middle. *Sītā* became thus the wife of *Rāma*; while *Janaka* gave *Urulā* to *Lakshman'a*, *Mān'darī* to *Bharata*, and *Srutakīrtī* to *S'atrughna*. On his way home, *Rāma* met *Paras'urāma* (see the sixth *Avatāra*) who, having heard of his namesake's bow-feat at the court of *Janaka*, challenged him to bend also the bow of *Vishn'u*, which he had received from his father, *Jamadagni*, and if he could do so, to a single combat. *Rāma*, displeased with the doubt of *Paras'urāma* in his strength, immediately seized the bow, bent it, and would have killed the son of *Jamadagni*, had he not respected his quality as a *Brāhman*: still, he destroyed the worlds which the latter had acquired by his penance, and thus excluded him from heaven. (This account given of the meeting of the two *Rāmas*, in the *Rāmāyan'a*, would seem to show that at the time when this poem was composed, the *Paras'urāma* was not yet conceived as an incarnation of *Vishn'u*, since he is represented in it as jealous of the defeat which *S'iva*'s bow had suffered at the hands of the son of *Das'aratha*.) After this event, *Bharata*, and his brother *S'atrughna*, were sent by their father on a visit to *Bharata*'s maternal uncle, *As'rapati*; and *Das'aratha*, who was old, and desired to retire from the world, made all preparations for installing his eldest son, *Rāma*, as heir-apparent to the throne of *Ayodhyā*. But in this design he was frustrated; for, through the intrigues of *Mantharā*, the hunchbacked nurse of *Bharata*, and his queen *Kaikēyī*, he was, in a weak moment, prevailed to upon grant any wish which the latter would ask of him; and *Kaikēyī*, availing herself of *Das'aratha*'s rashly-given promise, demanded of him the installation of her own son, *Bharata*, as heir apparent, and the banishment to the forest of *Rāma* for a period of 14 years. A promise once uttered being irrevocable, and *Rāma* having resolved not to cause a word given by his father to remain vain, neither the wishes of the people of *Ayodhyā* nor those of *Bharata* and *S'atrughna*, who meanwhile had returned, and were enraged at what had occurred, could shake his determination to submit to his exile. *Das'aratha* died in consequence heart-broken, and *Bharata* assumed, till the return of *Rāma*, the government of *Ayodhyā*.

The long exile of *Rāma* which now followed, and was shared in by his brother *Lakshman'a*, became, then, the source of the wonderful events which should hereafter lead to the destruction of the demon *Rāvan'a*. They began with a series of conflicts which he had to sustain with the *Rākshasas*, who infested his forest abode, and which invariably, of course, ended in the destruction of these beings. One of these conflicts, however, was especially pregnant with the destiny he had come to fulfill. *Rāvan'a*'s sister, *Sarpas'ikhā* (lit., a female whose finger-nails were like winnowing baskets), was one of those demons who haunted the woods. She fell in love with *Rāma*, but was repelled by him; and when, in a fit of jealousy, she attacked *Sītā*, *Lakshman'a* cut off her ears and nose. Enraged at this treatment, she repaired to her brother *Rāvan'a*, and in order better to stimulate his revenge, she also excited in him a passion for *Sītā*. *Rāvan'a* therefore started off for the forest *Dandakā*, where *Rāma* lived; and, aided by another demon, *Maricha*, who transformed himself into a golden-colored deer, and thus enticed both brothers away from the hermitage, to chase after it, succeeded in carrying off *Sītā* to his capital. By means of some other supernatural events then happening, *Rāma* discovered the fate of his wife; and the remainder of his exile is now filled up with his preparing for war with *Rāvan'a*, conquering and destroying him, and recovering *Sītā*, whose honor had remained untarnished during her long and severe trials when kept as a prisoner in the harem of *Rāvan'a*. Some of the incidents of this struggle are of special interest, inasmuch as they are the basis of traditions still prevalent in India. They chiefly relate to the allies of *Rāma*, who were no other than miraculous bears and monkeys, and by their magic powers mainly brought about the defeat of *Rāvan'a* and his armies, while also helping him to communicate with *Sītā* during her captivity. All these bears and monkeys were of divine origin, produced at the behest of *Brahman* by the gods for the express purpose of becoming the allies of *Rāma*. Thus, the bear-king, *Jimbavat*, issued from the mouth of *Brahman* himself; *Bālī* was a son of *Indra*; *Sugrīva*, of the *Sun*; *Tūra*, of *Vrihaspati*; *Gandhamādana*, of *Kuvera*; *Nala*, of *Viswakarma*; *Nila*, of *Fire*; *Sushena*, of *Varun'a*; *Sarabha*, of *Parjanya*; and the most renowned of all, *Hanumat*, was a son of *Wind*. See the article *HANUMĀN*, where several of his feats are mentioned. They overbridged the sea, to carry their armies to *Ceylon*—whence the line of rocks in the channel is still called *Rāmasetu*, or *Rāma's bridge*—in the English maps, *Adam's bridge*; they brought large rocks from the *Himālaya* to support the bridge—whence the numerous rocks scattered all over India are supposed to have arisen as they dropped down on their transport to the sea; and they performed similar other feats, still commemorated in festivals performed in honor of *Hanumat* and his tribe. As is the case in other *Avatāras* of *Vishn'u*, there is also in the *Rāma-Avatāra* a personage who, though nearly related to the fiend doomed to destruc-

tion, acknowledges the divine nature of the incarnate god, and dissuades his friends from opposing him. In this Avatāra, such a personage is *Vibhishan'a*, the uncle of Rāvan'a, whose counsel, however, is disregarded. Similarly disposed is also *Kumbhakarn'a*, the brother of Rāvan'a, who likewise understands that Rāma is Vishn'u; but, as he yields to the orders of his brother, his fate is death. Vibhishan'a, however, in reward of his proper conduct, is, after Rāvan'a's death, placed on the throne of Ceylon. When, at the end of this fierce war, the time fixed for Rāma's exile had expired, he returned to Ayodhyā with Sitā, whose purity had previously been tested by an ordeal of fire, and there received back from Bharata the sovereign power which, in the mean time, the latter had exercised in his stead; and at the end of a long and glorious reign, he became reunited with the splendor of Vishn'u. The story of this incarnation is briefly told in an episode of the Mahābhārata (q.v.), and in several Purān'as; with the fullest detail, however, in the *Rāmāyan'a* (q.v.). A copious abstract of the latter is given in the poem *Bhat'tikārya*. See SANSKRIT LITERATURE. The English reader may consult, for some further detail, an "Analysis of the Rāmāyan'a," in prof. Monier Williams's *Indian Epic Poetry* (Lond. 1863).

8. The *Kr'ishn'a-Avatāra* and *Balarāma-Avatāra*.—The former of these two, which are generally treated as one, is the most interesting incarnation of Vishn'u, both on account of the opportunity which it affords to trace, in Hindu antiquity, the gradual transformation of mortal heroes into representatives of a god; and on account of the numerous legends connected with it, as well as the influence which it exercised on the Vaishnava cult (see VAISHNAVAS). In the Mahābhārata (as Dr. Muir has shown in the fourth volume of his excellent work, *Original Sanskrit Texts*), Kr'ishn'a—which literally means, "the black or dark one"—is sometimes represented as rendering homage to S'iva (q.v.), and therefore acknowledging his own inferiority to that deity, or as recommending the worship of Umā (q.v.), the consort of S'iva, and as receiving boons from both these deities. In some passages, again, he bears merely the character of a hero endowed with extraordinary powers, and, in some, his divine nature is even disputed or denied by his adversaries, though they are ultimately punished for this unbelief. As the intimate ally of the Pān'du prince, Arjuna (see PĀN'DAVAS), he claims, especially in the philosophical episode, the Bhagavadgītā, the rank of the supreme deity; but there are other passages, again, in the Mahābhārata, in which the same claim of S'iva is admitted, and an attempt is made at compromising their rival claims by declaring both deities one and the same. Sometimes, moreover, Kr'ishn'a is, in this epos, declared to represent merely a very small portion—"a portion of a portion," as it is called—of the divine essence of Vishn'u. In the Mahābhārata, therefore, which is silent also regarding many adventures in Kr'ishn'a's life, fully detailed in the Purān'as, the worship of Vishn'u in this incarnation was by no means so generally admitted or settled as it is in many Purān'as of the Vishn'uit sect: nor was there, at the epic period, that consistency in the conception of a Kr'ishn'a-Avatāra which is traceable in the later works. The principal legends relating to Kr'ishn'a, as he appears in the Harivans'a and the Purān'as, are the following: A demon king, *Kansa* of Mathurā, of the race of Yadu, and therefore of the lunar line of kings, who, in a former birth, had been the demon *Kālanemi*, had deposed and imprisoned his father, *Ugrasena*, and oppressed, with his iniquitous hosts, the Earth; and Earth having laid her complaints before an assembly of the gods on Mt. Meru, Brahma prayed to Vishn'u to relieve the world of its distress. When he had ended his prayer, Vishn'u plucked off two hairs, one white, and one black, and promised the gods that these two hairs should become impersonated as *Balarāma* and *Kr'ishn'a*, sons of Devaki, to fulfill their wishes. Now Devaki, who, in a former life, had been Aditi (space personified), was a wife of Vasudeva, who was of the race of Yadu, and a relative of Kansa; but as Kansa had been warned by a voice in heaven that their eighth child would be an incarnation of Vishn'u, he placed both husband and wife in confinement, after having obtained, though, from Vasudeva the promise that he would deliver to him every child Devaki would bring forth. Six children of hers were accordingly given up to Kansa, and destroyed; but when Balarāma, the seventh, was about to come into the world, Vishn'u appeared to *Yogendrā*, a form of Umā (q.v.), and directed her to transfer Balarāma, before the time of his birth, to *Rohini*, another wife of Vasudeva, and spread the report that Devaki had miscarried; enjoining her also to become incarnate as a child of Yas'odā, the wife of an old cowherd Nanda, at the same time that he would become incarnate, as Kr'ishn'a, in the eighth conception of Devaki; for at the time of their simultaneous birth, he added, Vasudeva, aided by him, would bring the infant Kr'ishn'a to the bed of Yas'odā, and her to that of Devaki. In this manner, *Balarāma* and *Kr'ishn'a* were saved, though the infant Durgā, as soon as born, was dashed by Kansa against a stone, and suffered a temporary death. Kansa, having become aware that his design had been frustrated, now ordered the destruction of all young children, wherever they might be found, but considering it useless to keep Devaki and Vasudeva any longer in prison, liberated them. Vasudeva, apprehensive of the safety of Balarāma, then took him to Nanda, to be brought up together with Kr'ishn'a; and thus began the earthly career of these two Avatāras of Vishn'u, in which Balarāma always figures as the friend and ally of his more important brother, Kr'ishn'a. The first miraculous act of the latter consisted in causing the death of a female demon, *Putanā*, who suckled and meant to destroy him. Then, as a little boy, he overturned a heavy wagon of the cowherds,

and pulled down the trunks of two large trees—to the amazement of the cowherds, who did not yet suspect his divine nature, and, becoming afraid to remain any longer in Vraja, the place where these events happened, repaired to Vr'indāvan'a. There Balarāma and Kr'ishn'a remained until they had attained seven years of age. At this time Kr'ishn'a killed a serpent-monster Kāliya, in the Yamunā river, and then returned to Vraja. The next exploit of the brothers, more particularly, however, of Balarāma, consisted in the destruction of two demons, *Dhenuka* and *Pralamba*, who infested the forests; but that which followed, especially established the fame of Kr'ishn'a, and is one still commemorated in their festivals by the worshippers of this god. When sporting in Vraja, he once found all the cowherds busily engaged in preparing for a sacrifice to be offered to Indra (q.v.). Seeing this, he dissuaded them from worshiping this god, and directed them to address their prayers and offerings to the mountain *Govardhana*. Indra, however, offended by these proceedings, sent a heavy storm, which inundated the country, and threatened to destroy the cattle. Thereupon, Kr'ishn'a plucked up the mountain Govardhana from its base, and held it up as a large umbrella over the cowpens, to shelter the herdsmen and their cattle from the storm. For seven days and nights they were thus protected by the elevation of the mountain; and Indra, at last convinced of the irresistible might of Kr'ishn'a, came to Govardhana, and worshiped him, obtaining on this occasion the promise that Kr'ishn'a would befriend the Pān'du prince, Arjuna, in his conflict with the Kurus (see MAHĀBHĀRATA). The episode in the life of Kr'ishn'a which now ensued, and is filled up with the pleasures and sports he enjoyed among the Gopis, or cowherdesses, is that commemorated in the Rāsa Yātrā, an annual festival celebrated in various parts of India in the month of Kārtika (Oct.-Nov.), and dwelt upon in many poetical works. Of these cowherdesses, later poets especially mention *Rūdhā*; and she is sometimes also represented as the divine or mystical love to which Kr'ishn'a returns at the end of his more worldly amours (see the article JAYADEVA). After some more miraculous deeds, Kr'ishn'a and Balarāma repaired to Mathurā, where Kansa, in the hope of affecting their death, had invited them to assist at a solemn rite of the lustration of arms, and to engage in a trial of strength with his chief boxers, *Chān'ūra* and *Mushtika*. *Akrūra*, sent by Kansa to convey to them his invitation, had already revealed to them the purpose for which he was despatched; but undaunted by his words, they accomplished their journey, during which they performed several other wonderful deeds, and, arrived at Mathurā, accepted the challenge of Kansa. The contest ended not only in the death of the two boxers, but in that of Kansa also. Kr'ishn'a now released *Ugrasena*, Kansa's father, from the confinement in which he was kept, and restored him to the throne of Mathurā. A number of other miraculous feats now followed in the career of Kr'ishn'a. The principal are his conquering *Jarāsandha*, the father-in-law of Kansa, who came to revenge the death of the latter, and *Kālayavana*, a king of the Yavanas, who also overran Mathurā with his armies; and his founding the city of Dwārakā. At the end of these wars, he made a short stay at Vraja, then returned to Dwārakā, and there married Revati, by whom he had two sons. But he also carried off violently *Rukmiṇī*, the daughter of a king of Vidarbha, who had been betrothed to *Sis'upāla* (q.v.), and had to wage a hot contest with the latter and his allies, before he conquered them. His next war was that with *Naraka*, a demon-king of Prāgyotisha, who had robbed Aditi of her earrings, and ultimately was put to death by him. He then repaired to Indra's heaven, to restore to Aditi her earrings; but carrying off a wonderful tree from Indra's garden, got into a conflict with this god; ultimately, however, he was allowed by him to take the tree to Dwārakā. There he married 16,100 maidens, whom he had rescued from Naraka. Other wars followed, in one of which Kr'ishn'a also fought with S'iva, when siding with his enemy Bān'a, who was a son of Bali. The most important, however, of all these contests is the great war between the Kurus and Pān'dus, in which Kr'ishn'a was the ally of the latter. According to the *Vishn'u-Purāṇa*, Kr'ishn'a's earthly career was brought to its close by an event which has nothing in it of the miraculous, and is more consistent with the end of a mortal hero than with that of an incarnate god. He was accidentally shot in the sole by a hunter, who thought that he was aiming at a deer. The hunter, it is true, is called *Jarā*, which is a word in the feminine gender, and means "old age," or "decay;" but even if a mere allegory, the story of his end "from old age," or an arrow, barely tallies with the character assigned him in the *Purāṇas*, and is therefore sometimes also omitted in the accounts of this Avatāra.—For Balarāma, see also the legend in the article YAMUNĀ.

9. The *Buddha-Avatāra*, or Vishnu's epiphany as Buddha.—It is originally foreign to the cycle of the Avatāras of Vishn'u, and therefore only briefly alluded to in some *Purāṇas*. Where this is done, the intention must have been to effect a compromise between Brahmanism and Buddhism, by trying to represent the latter religion as not irreconcilably antagonistic to the former. See BUDDHISM.

10. The *Kalki*-or *Kalkin-Avatāra*.—It is yet to come, "when the practices taught by the Vedas and the institutes of the law, shall have ceased, and the close of the Kali or present age shall be nigh." Vishn'u will then be born "in the family of *Vishn'u-yas'as* (possessing the glory of Vishn'u), an eminent Brahman of Sambhala village, endowed with the eight superhuman faculties. He will then destroy all the barbarians and thieves, and all whose minds are devoted to iniquity."—*Vishn'u-Purāṇa*.

Vishn'u's wife is *S'rī*, or *Lakshmi* (q.v.), and his paradise *Vaikunt'ha*. When repre-

sented, he is of a dark hue, with four hands, in which he holds a conch-shell, blown in battle, the *Pīnachajanya*; a disk, the *Sudarśana*, an emblem of sovereign power; a mace, the *Kaumodaki*, as a symbol of punishment; and either a lotus, as a type of creative power, or a sword, the *Nandaka*. On his breast shines the jewel *Kaustubha*. He is variously represented: sometimes, as *Nārāyaṇa** (see the first Avatāra), when floating on the primeval waters, and resting on *Śeṣha*, his serpent of infinity—the god Brahman coming out of a lotus that arises from his navel, and Lakshmi being seated at his feet; or riding on *Garud'a*, a being half bird and half man, or seated on a throne, and holding Lakshmi on his lap; or, if he is represented in one of his incarnate forms, as fish, boar, man-lion, etc., he has a human shape, ending in a fish, or a human body with a boar's head, or with a lion's head; or he appears as a dwarf, or (as *Paras'urāma*) armed with an axe; or (as *Balarāma*) holding a plow-share. As *Kṛ'ishṇa*, he is generally represented in a juvenile form, or as an adult, in a dancing posture, and playing on the flute. As *Kalki*, he has a sword in his hand, and is kneeling before a winged horse. The leading personages or events connected with these Avatāras are likewise frequently associated with the representation of the god: thus, in the representation of the fourth Avatāra, *Hīraṇ'yakas'ipu*, as being torn open by the man-lion; or, in that of the sixth, the demon *Arjuna*, fighting with *Paras'urāma*; or, in that of the seventh, the ten-headed *Rāvaṇ'a*, battling with *Rāmachandra*; or *Hanumat* and the monkey chiefs, paying adoration to the latter; while his brothers stand at his sides, and *Sītā* is sitting on his lap; or, in the eighth Avatāra, the mountain *Govardhana*, when uplifted by *Kṛ'ishṇa*, and the *Gopis* sporting with him. *Vishṇu* is praised under thousand names, which are enumerated in the *Mahābhārata*, and have been commented upon by *S'ankara*, and other authors.—For other myths relating to *Vishṇu*, the general reader may consult *H. H. Wilson's* translation of the *Vishṇu-Purāṇ'a*, which has been recently re-edited by *Fitz-edward Hall* (five volumes, with index, Lond. 1864-76); the first nine books of *Le Bhā-gurata-Purāṇ'a*, traduit et publié par *Eugène Burnouf*, vols. i.-iii. (Paris, 1840-47); *Hārivaṇ's'a*, traduit par *A. Langlois*, vols. i., ii. (Paris, 1834-35); *Lassen's Indische Alterthumskunde*, vol. i. (2d edition, Leipzig, 1866), vols. ii.-iv. (Bonn and Leipzig, 1852-61); and the first and fourth volumes of *John Muir's Original Sanscrit Texts* (Lond. 1858, 63); see also the representations of *Vishṇu* in *Edward Moor's Hindu Pantheon* (Lond. 1810).

VISHṆU-PURĀN'A. See **PURĀN'A.**

VISIBLE SPEECH, a system of alphabetic characters, each of which represents the configuration of the mouth which produces the sound. The system is the invention of *Mr. Melville Bell*—the well-known elocutionist, formerly professor of elocution in University college, London—and was published in 1867, under the title of *Visible Speech* (*Trübner*). *Mr. Bell* has since published a short shilling work—*English Visible Speech for the Million* (*Trübner*), which is quite enough to give a general idea of the system.

Mr. Bell, believing his system to be practically, as well as theoretically, perfect, was anxious to bring it into general use at once, and accordingly made a very generous offer to relinquish all his rights if the expense of casting the new types and publishing the theory of visible speech were defrayed by the government. The proposal was rejected, and *Mr. Bell* was compelled to publish his system as an ordinary copyright.

Now that the system has been thoroughly tested by the very few who are competent to do so, we are able to give a definite and impartial opinion on its merits, and to say that the absolute perfection that *Mr. Bell* attributed to it does not exist—that the analysis of sound-formation on which it is based is, in some instances, imperfect or erroneous, and that the symbols might, in many cases, be improved, even where there is no fundamental error of analysis to correct. The chief defects in *Mr. Bell's* analysis of speech-sounds are: (1) his ignorance of the latest results of German investigations of the mechanism of the throat sounds (whisper, the Arabic gutturals, etc.); (2) his imperfect knowledge of the *synthesis* of sounds, syllabification, word-division, etc.; (3) errors of detail, especially in the consonants, such as his including *f* under the same category as *l* ("divided" consonants), and his analysis of *th*. Other points are still doubtful, and it is certain that, as our knowledge advances, many other difficulties will appear. But it is none the less true that our very knowledge of these defects is due to the vantage-ground on which visible speech has itself placed us. It was an immense advance upon any phonological analysis previously attempted, and opened up once for all the way to arrive at definite results. It was, in short, a *new instrument* placed in the hand of the student of phonetics, and it must, it is clear, for many years to come, continue to be a purely scientific instrument. When finally perfected there can be no doubt that it will come into general use, and finally supersede the present system.

Apart from the question of absolute perfection, we cannot refuse *Mr. Bell's* analysis our profound admiration as a great work of genius. Unaided by the resources of the German physiologists, he has completely beaten them on their own ground: where they, with all the resources of the laboratory at their command, have painfully collected a few isolated observations, he has erected a splendid edifice. And it is precisely where they utterly break down—namely, in the analysis of the vowels—that his genius shines most

* "The waters are called *nāra*, because they were the production of *nara* (or the supreme spirit); and since they were his first *ayana* (or place of rest, when in the form of the god Brahman), he thence is named *Nārāyaṇ'a* (or resting on the waters)."—*Manu*, i. 10.

brightly. By his discoveries of the distinction of "narrow" and "primary," of the "mixed" vowels, intermediate between the guttural and palatal ones, and of the compound character of the labial vowels, Mr. Bell has been able to select from the enormous number of shades of vowel-sound (for every movement of the tongue produces a new sound), certain definite formations, thirty-six in number, all definitely correlated, which include, with the various intermediate formations, all possible simple vowel sounds.

The system of notation is not less a work of genius than the physiological analysis on which it is based. All the letters are formed by the combination of about thirty radical symbols, most of which are, to a certain extent, pictorial of the action of the organs which produce the sound. Thus a simple circle **O** represents breath issuing from the open throat (aspiration); while the *narrowing* of the glottis which produces vocal murmur is symbolized by **I**, from which, by modifiers to indicate guttural, palatal, "primary," "wide," etc., all the vowel symbols are formed. Contraction in the mouth is indicated by a **C**, and the *part* of the mouth in which the contraction takes place is shown by the direction in which the symbol is turned—thus, **C** denotes contraction in the *back* of the mouth (Scotch and German *ch* in *loch*), **◡** denotes lip-contraction. Complete stoppage is indicated by drawing a line across the opening, giving a symbol resembling **D**, which turned this way would represent the sound of *p*, while **◡** would represent *k*. The symbols for vocality, nasality, etc., are similarly incorporated into the consonant symbols. This will be enough to show the two chief features of the system: (1) its simplicity and perfect consistency; and (2) the correlation of the symbols. Thus, when the student has learned to recognize the symbol for *m* as differing from *b* only in the addition of the sign for emission through the nose, he is at once able to recognize and form for himself the symbols of *ng* and *n*, if he is already acquainted with those of *g* and *d*. Such a system is evidently of the highest value in all philological investigations which involve the study of sound-changes in different languages. It has been found that many phenomena of language, such as "umlaut," which, when formulated in the ordinary Roman type, require a long technical exposition to be made intelligible, explain themselves at once without further comment when transliterated into the visible speech symbols. It is from the use of visible speech by scientific philologists that we hope most, both for the progress of phonetics and general philology, and also for the improvement and ultimate practical application of visible speech itself. A striking example is afforded by Dr. J. A. H. Murray's admirable work on the *Southern Dialects of Scotland*, in which the phonetic portion owes its clearness and exactness mainly to the use of visible speech. It has also been employed by Mr. H. Sweet in his *History of English Sounds*. Mr. A. J. Ellis, lastly, the father of scientific phonology in England, although employing a system of his own, refers constantly to visible speech, to establish the absolute value of his symbols.

The practical applications of the systems to the acquirement of the pronunciation of foreign languages, to telegraphy, to the instruction of the deaf and dumb (for which it is already largely employed in America), and to general elocutionary purposes, are self-evident. It is clear that visible speech has a brilliant future before it, and it is the duty of all interested in the advancement of science and education to do all they can to disseminate a knowledge of it among all classes.

VISIGOTHS. See **GOTHS**.

VISION, the act of seeing; that faculty of the mind by means of which, through its appropriate material organ, the eye (q.v.), we are percipient of the visible appearances of the external world. Considered in the latter signification, vision includes questions of high importance in relation to some of the most intricate problems of philosophy; as this part of the subject has already been discussed under **PERCEPTION**, the present article will be restricted, as far as possible, to an exposition of the phenomena and laws of vision proper. In opposition to the bulk of mankind, who believe undoubtedly that they actually *see* the externality and solidity of the bodies around them, bishop Berkeley maintained that these properties are not the immediate objects of sight at all, but are simply ideas derived originally from the touch, and erroneously attributed to vision, in consequence of their having been uniformly experienced concurrently with certain "visible signs" (as, for example, color), with which alone the sense of sight is truly conversant; and this theory of vision having since received the adhesion of a great majority of the most able metaphysicians, it will be proper to give an outline of its leading propositions. In doing this, we shall at the same time intersperse such remarks and counter-statements as may appear to be rendered necessary by the progress of opinion and the results of modern experimental inquiry. First, as to the externality, or outness of objects; or, which is the same thing, their distance from the eye. This, Berkeley maintains, cannot of itself and immediately be seen. "For distance being a line directed end-wise to the eye, it projects only one point in the fund of the eye; which point remains invariably the same, whether the distance be longer or shorter." To this position, everywhere assumed by Berkeley to be indisputable, and by his followers admitted to be so, it may be objected, that it contains an unwarranted assumption, viz., that a ray of light is, by its very nature, incompetent to convey an impression indicative of its possessing length or extension; or, to speak more accurately, it assumes that "apparent distance" is not at all affected by a variation in the actual length of the ray intervening

between the eye and the object. Yet it seems obvious, that the facts of vision do not admit of our arguing the matter, as though the line extending from any point of an object to the eye were a mere mathematical abstraction. Every visible point sends forth diverging rays, which form a cone whose base is on the pupil of the eye; and to the eye the place of this visible point is at the intersection, real or virtual, of the rays in question: real, when the radiant point is viewed directly; virtual, when the rays, either by refraction or reflection, are diverted from their original path before reaching the eye. To take a case of refraction: if we notice the distance of a shilling lying at the bottom of an empty vessel, we shall observe, upon filling the latter with water, a manifest diminution in the apparent distance of the shilling, the reason being that the rays, on their emergence from the water, are bent outward, so that the point of their virtual intersection is brought nearer to the eye. In reflection, the place of a visible point is, in like manner, referred to the point of virtual intersection of the cone of rays incident upon the pupil; and by multiplied reflections, the apparent distance of a point actually adjacent to the eye, may be increased to an almost indefinite degree. It is forcibly contended by Berkeley that these facts, involving, as they do, geometrical considerations known only to few, and by none consciously realized in the act of vision, cannot be concerned in our appreciation of distance by the visive faculty. Yet these, and numberless similar experiments, render it evident that both "apparent distance" and "apparent place" are closely dependent upon these geometrical conditions; and, therefore, without assuming that vision is performed by the aid of connate or instinctive geometry (a notion justly condemned by Berkeley), it yet seems highly probable that these lines and angles are the exponents and invariable concomitants of an actual operation of light upon the eye, specific in its character, and by reason of its necessarily varying, *pari passu*, with every change in the distance of the point of intersection of the visual rays, fitted to convey to us an intuitive perception of varying distance.

In the article eye (q.v.), it has been shown (as, indeed, necessarily follows from optical principles) that the eye does actually undergo specific modifications, depending for their amount on the distance of the object; and there therefore seems an intrinsic probability that these distasteful variations in the organ of sight are correlated to those facts of our consciousness which we denominate variations of visible (not tangible) distance; and as, furthermore, it may be demonstrated by optical experiments that the "apparent distance" of a visible point is directly modified, to our perception, by a simple change in the mutual inclination of its diverging rays, it seems an inevitable conclusion, that that agency of light which suggests to our minds differences of distance is competent to suggest distance itself.

Berkeley was quite aware of the necessary connection which subsists between the distance of an object and the divergency of the rays it emits, though it may be doubted whether he adequately weighed the importance of the train of consequences evoked within the eye itself by this variable divergency of incidence; but he affirms that the mind is not by these means helped to a conception of distance except in so far as by experience we have found that increased divergency, carried to the extent of producing "confused vision," is constantly associated with diminished distance. And in proof that this association is merely accidental, Berkeley cites a curious optical experiment, which shows that where the incident rays are caused slightly to converge, instead of their suggesting, as one would be led to expect, that the object is at an enormous distance, the result is altogether different; viz., at first, when the eye is close to the lens, and vision distinct, the object is seen at its true distance, but afterward, as the eye is gradually withdrawn, and vision becomes continually more "confused," the object appears to be enlarged in all its dimensions, and to approach nearer and nearer, until it vanishes in mere confusion from the view. "This phenomenon," he says, "entirely subverts the opinion of those who will have us judge of distance by lines and angles, on which supposition it is altogether inexplicable." To which it may be replied, that the hypothesis being that the mind judges (mediately) by "the various divergency of rays," it cannot fairly be tested by experimenting with rays that are convergent, and that necessarily produce conditions of vision the reverse of those normally prevalent. But, besides, it is now certain that the explanation given by Berkeley is not the true one; for it has been shown, by prof. Wheatstone, that when the dimensions of a retinal picture are continuously increased (as is the case in the above experiment), the object appears to approach in the most evident manner.

From the doctrine of Berkeley, that the sight is not immediately perceptive of distance, it necessarily follows that the parts of a solid object will not be seen as some of them more remote than others, but as if situated all in one and the same plane. This opinion has accordingly been maintained by more recent writers; yet its unsoundness seems manifest; for, if objects be originally seen, not as solid objects, but as perspective representations on a plane, then this plane must be seen either at no distance (which is absurd), or at the same distance for all objects (for which no reason and no evidence can be assigned); or at distances varying with the distances of the objects; but as the last two and only tenable suppositions assume the visual perception of distance, which is the very principle sought to be invalidated, the theory is thus shown to be futile and self-contradictory. If it be admitted that, by the constitution of the organ of sight in relation to light, we are perceptive of distance at all, it is in the highest degree proba-

ble, judging not only from analogy, but from the proved distantal affections of the eye, that we perceive by the sight degrees of distance; and a perception of the latter implies, it has been shown, a perception of trinal dimensions. Now, although it is strenuously maintained by the adherents of Berkeley that this is not a primitive attribute of vision, it is not denied by any, that in the exercise of our mature sight, we do undoubtedly perceive the outness, the distance, and the trinal extension of visible objects; but, say they, these very qualities, not being modifications of light or colors, are only in appearance directly perceived by the eye; they are, in fact, the product of tactual experience, but by long and invariable association with the phenomena proper to sight, are now instantaneously suggested by them, in a manner so intimate that the two sets of perceptions have become, to our consciousness, indissolubly one. This, in effect, is to affirm that we cannot see an object to be possessed of trinal dimensions, until its occupancy of space is assured to us by the touch; whereas, we venture to maintain, that we see objects to occupy space, and that what we owe to experience is a knowledge that the major part of these visible appearances have, underlying them, that which, on our making a proper disposition of our bodies, will produce in us tactual sensations. We advisedly say the major part, because there are many objects in nature, such, for instance, as wreaths of smoke and vapor, which, though to the sight visibly possessed of trinal dimensions, are totally imperceptible to the touch. And this suggests the remark, that a great diversity of opinion has arisen out of the ambiguous meaning of the word "solidity," by which those who agree with Berkeley always signify, not mere occupancy of space, which, as we have shown, may be associated with a total absence of tangible qualities, but "resistant extension" in three dimensions, which, beyond all doubt, is solely cognizable by the touch. It is, of course, in the former sense alone that we vindicate to the sight an immediate perception of "solidity;" and we do not use the term "occupancy of space" at all in the sense of mechanical exclusion, an idea manifestly derived from touch, but only as affirming the immediately perceived trinal extension of visible objects. It may also be here remarked, that there are many substances of extreme hardness, and therefore in the highest degree perceptible to the touch, which, though set in a strong light, remain quite invisible; as, for example, the sheets of plate-glass used by prof. Pepper in producing his "ghost-illusions." Indeed, strictly speaking, all *perfectly* transparent substances, and all *perfectly* reflecting (polished) surfaces, are invisible. Again, there are many appearances in nature, into our perception of which there enters no element of tactual experience, even as it respects variety of surface (color, of course, being excluded from this consideration); as, for example, the waves of the sea, spread out in long undulating lines, or breaking in foam upon the shore; and all those objects which, by their minuteness and the delicate diversifications of their shape and outline, elude the cognizance of the touch. These facts are adduced simply to illustrate the complete distinction and independence which subsists between the two sets of sensations, originating, respectively, with the sight and the touch—a point strongly enforced by Berkeley himself, who did not hesitate to affirm, not only that our habit of referring the two sets of sensations to the same objects is the mere effect of our having experienced them together, but that the two sets of ideas thus "intromitted into the mind" belong, in fact, to two classes of objects, numerically distinct—the one outward, distant, and tangible; the other visible, but at no distance, and therefore, in reality, contained within the mind itself. But, as has been well pointed out by Mr. Bailey, this very distinction, taken in conjunction with the undoubted fact, that we do in maturity apprehend by the sight the distance of visible objects, furnishes a strong presumption that those perceptions cannot have belonged originally to the touch. How little tactual sensations are able to modify visual perceptions is exemplified (as Mr. Bailey remarks) by the fact, that "a straight stick, with one end placed in a basin of water, would still appear to the sight to be bent at that end, after a thousand proofs by the touch that it was otherwise." In the same way, the finger immersed in water appears "unnaturally bent, though the experimenter feels it to be otherwise."

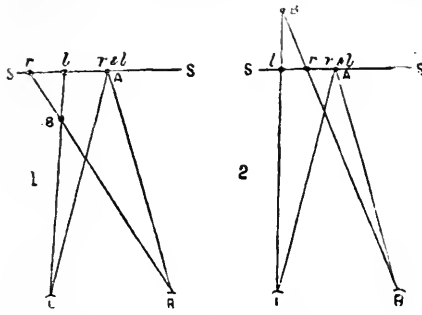
The nature of "visible" or "apparent distance," and how it compares with "real distance," we shall consider when we come to speak of apparent, as contrasted with real magnitude. But we will first inquire what are the optical conditions within the eye itself which determine our perception of the direction of a visible point. Every such point, as we have before remarked, radiates to the eye a cone of diverging rays, whose base is situated in the pupil of the eye; and these rays being refracted in their passage through the eye, are brought to a focus on the retina, thus forming another cone, the base of which is opposed to that of the incident cone, while its apex coincides with the focal point of the refracted rays. If the point of emission be placed directly before the eye, it will be seen in the direction of the common axis of these two cones; or, in other words, in the optic axis; and the central point in which this axis passes through the common basis of the two cones is called the optical center of the eye. Let us suppose, now, another visible point, a little above the first, but at an equal distance from the eye; this, too, will send forth to the eye diverging rays, which will, in like manner, be refracted to a focus upon the retina at a point a little below the preceding; and the line of visible direction will pass from the point of convergence on the retina through the optical center. Now, it is evident that the rays, by means of which we see a visible point, come to the retina from all possible directions within the limits of the cones they

collectively form. How comes it, then, that we perceive the object only in one determinate direction? The explanation usually given (founded on experiments in which a portion of the cone has been excluded without apparent change in the visible direction) is, that, by the constitution of the sense, upon any point in the retina receiving the apex of a cone of rays, we perceive the object in a right line extending from that point of the retina through the optical center; or, according to others, in a right line perpendicular to the surface of the retina at that point. It will, however, be more consistent with the principle that the incidence of light is accompanied by a positive action, related to its direction as well as to its other properties, if we express the law of visible direction by saying, that upon a multitude of rays from all possible directions falling upon a retinal point, the perceived direction is the mean or resultant of them all; which is just as true an account of the phenomena, and amounts, we think, to something more than a verbal distinction. The optical facts we have thus, in brief, indicated, if followed out with respect to all the visible points forming the objects of sight, render it evident that inverted images of the latter are painted upon the retina and the inquiry is prompted, how these can give rise to erect vision. On reflection it will be seen that an explanation of this old and much debated "paradox of vision," is involved in the preceding statement of the law of visible direction, in whichever way it may be expressed; and, as has been shown by previous writers, the difficulty itself has arisen solely from the assumption, contrary to fact, that we *see* the retinal pictures, whereas, considered as images, they are not even the means, but only the concomitants of that operation of light by which we see. Even this important distinction, however, does not convey the whole truth; and we trust it will not be deemed an unnecessary refinement, if we point out that in a strict sense there is no *image* upon the retina, but only a concourse of rays, which, *to the eye of another person*, will undoubtedly give the perception of an image, but cannot be affirmed to exist, as an image, except in relation to this second observer. It is therefore with this reservation that the term retinal images is here made use of. As a consequence of all the lines of visible direction passing through the center of the eye, it follows that as an object recedes from or approaches the eye, its retinal image becomes proportionally less, or greater; and in like manner, the visible object itself varies in magnitude, under certain limitations, to be presently referred to, with every change in its distance. But as "the magnitude of the object which exists without the mind, continues always invariably the same," it is evident, argues Berkeley, that "whenever we speak of the magnitude of anything, we must mean the tangible magnitude," which alone is measurable by "settled stated lengths." The sense in which this is true, clearly illustrates the nature of magnitude and distance, as apprehended by the sight, in contradistinction to what is called real magnitude and real distance, the product of tactual experience. It must not be understood as imputing to the touch of a superiority in mensurative capacity, but as simply meaning, that by the touch we come to know that the external world is endowed with resistant qualities—such as hardness, impenetrability, and incompressibility—qualities which we cannot conceive as modifiable by our bare visual perception of them; and from this experience accrues our conception of the reality and actuality of the magnitude and distance of objects, accompanied by a belief that the variability of magnitude and distance perceived by the sight is an appearance only, and dependent on conditions solely of a subjective kind. If this be a correct view, we are not forced to deny with Berkeley that the objects of sight are numerically the same as those we are cognizant of by the touch.

We must now pass on to the concluding part of the subject—viz., "single vision with two eyes;" in treating of which we shall have recourse, almost exclusively, to the masterly researches of sir Charles Wheatstone, of whose admirable discoveries in this department of knowledge we have already had occasion to speak in the article STEREOSCOPE (q.v.). It will be obvious to those who have read what is there stated, that the question of single vision with two eyes is naturally divisible into two classes—the first including those cases in which the optic axes are parallel, and the retinal images exactly alike; and the second, those in which the optic axes are convergent, and the retinal images dissimilar. Now, to see an object double is to see it in two different places at the same time; and therefore, if it can be shown that by the law of visible direction an impression upon corresponding points of the two retinæ is necessarily referred to the same place, this will account for our single vision of the object at that spot. And on consideration, it will be plain that this is really what happens when the optic axes are parallel, and the images identical. But it is also evident that this explanation does not apply to the second class of instances; in which the only visible point which depicts itself on corresponding portions of the two retinæ, is that point to which the optic axes are directed. All other points, whether situated before, beyond, or in the plane of the horopter,* are projected upon non-corresponding points of the retinæ; and as these conditions were presumed to be inconsistent with single vision, it was asserted by Aquilonius that objects are seen single only in the plane of the horopter (it has since, with greater consistency, been said, only at the point of intersection of the optic axes); but

* The horopter is a right line drawn through the point of intersection of the optic axes parallel with a line joining the centers of the eyes; a plane drawn through this right line at right angles to the plane of the optic axes, is called the plane of the horopter.

that this is not true is evinced by our common experience that, without movement of the optic axes, we enjoy a certain limited field of distinct vision. Its complete refutation, however, is involved in the theory of stereoscopic vision, which may be thus explained: Let the optic axis of the right eye (R) and of the left eye (L) be converged on the point A; suppose another point B, slightly to the left, and in advance of A; and then



through the point B draw lines from L and R respectively intersecting the plane of the horopter in r and l (fig. 1). Now, if two diagrams, SS, be prepared (the one representing l and A, and the other r and A), and these be presented to their appropriate eyes in the stereoscope, with the view of each eye limited to its own picture, the points r and l will be seen as a single point, situated not on the paper, but in advance of it, in the point of intersection of the lines of visible direction, indicated in the above construction by Rr and Ll . If the point B be supposed beyond A, and also to the left of it, the lines drawn from L and R to B will

intersect the plane of the horopter in l and r (fig. 2); and stereoscopic pictures SS prepared under these converse conditions will exhibit the points l and r as a single point placed behind A at the point of intersection of the lines drawn from L and R respectively. This simple rule involves, as it seems to us, the true principle of the stereoscope; and it is capable of being applied to the most complicated stereoscopic pictures. For, in a stereogram, let l and r stand for identical parts of the left and right pictures respectively, and suppose the pictures superposed; those parts which, read off laterally from left to right, stand in the order lr will recede, and those in the order rl will protrude (relatively to those parts of the pictures in which r and l absolutely overlaid each other), when the pictures are viewed together in the stereoscope. It appears, then, that vision of the third dimension of space is directly obtained by impressions on non-corresponding retinal points; the proof of this being given in the appearance of solidity experienced in the stereoscope, although perfectly plane representations are alone employed; but it would be an error to suppose that this non-correspondence is without a limit; and the question still remains, to what extent the retinal points affected may be non-correspondent, consistently with single binocular vision. Without attempting to propose any definite solution of this difficult question, it may, we think, be considered as highly probable that this limit is determined by the same law which regulates our distinct vision of objects by means of rays in exactly focussed on the retina; for, according to Mr. Abbott, "as long as the rays are contained within the area of one sensitive minimum, the sensation will be that corresponding to the vision of a point;" and "a certain amount of dispersion does not interfere with distinct vision." It seems certain that the double perception which is experienced of the further of two objects, when the optic axes are fixed on the nearer, or *vice versa*, can only arise when the object, thus doubled, is situated within the angle of the optic axes (whether before or beyond their intersection); for under these circumstances only, the sensitive points affected are not simply non-correspondent, but are utterly diverse, being in fact on different sides of the centers of the retina in the two eyes. That the law of projection of the various points composing the relief of a stereoscopic object is correctly stated above, is strongly corroborated by a curious experiment of sir C. Wheatstone's in which solid objects are placed in the stereoscope, instead of pictures. As, for example, two skeleton cubes, so placed, that when the optic axes converge upon them, identical pictures are depicted on the retinae; in which case, all appearance of relief vanishes, and a perfectly plane perspective representation of a single cube is alone visible; the reason being, that the lines of visible direction for each point intersect each other, neither before or beyond, but *in* the plane of the horopter, where, accordingly, the object is seen as a perspective projection. The same rule holds when the right and left eye pictures are interchanged, for the pictures being supposed, as before, to overlaid one another, the parts lr become now rl ; that is, instead of having their point of intersection beyond the plane of the horopter, they have it before that plane; and this, *mutatis mutandis*, being true of all the parts of the pictures, the stereoscopic resultant is the converse of that which would be perceived but for this abnormal arrangement. In these phenomena, named by sir C. Wheatstone the "conversion of relief," and copiously treated of by him in his various papers, the usual relations of distance also are reversed, the nearer parts being seen as further, while the latter are perceived to be of larger dimensions than the former; and, the same principle being applied to the vision of solid objects by means of an instrument called the pseudoscope (q.v.), also invented by sir C. Wheatstone, they are seen as if turned inside out, and under divers other aspects of a most extraordinary character, some account of which will be found in the article just cited. But, as to many of them, it is proper to mention, that the facility of conversion is found to depend, not on the optical conditions, which, of course, remain invariable, but upon mental conditions, as, for instance, previous famil-

ilarity or otherwise with the converse forms suggested; in short, upon our previous *visual* experience.

We have not yet considered those cases in which the retinal pictures are identical, and the optic axes convergent. In these, the law is, that the object is seen in the plane of the horopter, as is conclusively proved by a beautiful experiment, suggested by sir D. Brewster. If, while looking at a wall-paper, consisting of a small pattern, continually repeated at intervals not exceeding 2½ in. from center to center, we cause the eyes to converge to a point in front of the wall, the paper will appear to advance to that point, and will there be plainly visible, in spite of the contradiction of the touch, which, of course, cannot feel the wall where it is seen; while, on the other hand, the eye can perceive no wall in the place where the touch affirms it to exist. The converse of this experiment, although more difficult to perform, is equally curious and instructive. It has also been shown by sir C. Wheatstone, that if an increasing convergence of the eyes be unaccompanied by its usual concomitant, a corresponding enlargement of the retinal pictures, the object is seen as if continuously diminished in all its proportions, albeit the size of the retinal images remains unaltered. This experiment, which, with several others of almost equal interest and importance, may be performed by means of the stereoscope, also establishes that every degree of convergence of the optic axes is associated with the particular adaptation of the eye suited for distinct vision at that distance. This adaptation is, of course, directly dependent upon the divergency, less or greater, of the impinging rays, and this again stands in a necessary relation to the distance, real or virtual, of the point from which they diverge; a branch of the subject to which we have already given sufficient prominence. All observations and experiments concur in showing that a part of the highest importance is played in vision, by the convergence of the optic axes, in particular, in so far as this is conjoined with a difference between the two retinal pictures; and, for this reason, it matters but little that we cannot, within our present limits, enter on a discussion of the evidence obtained from those persons, blind from birth, who have gained their sight by means of a surgical operation; for, in almost every case, only one eye at a time was operated upon, and the information then obtained from the patients, under circumstances of so much difficulty, is admitted on all hands to be of a very dubious and unsatisfactory character.

By mere modification of the light incident upon the eye, the same visible objects may be seen under infinite variations of figure, situation, and magnitude; while, at the same time, their real figure, real situation, and real magnitude, as apprehended by the touch, shall remain unaltered; but these phenomena, artificially induced, argue nothing against the general fact, that under normal circumstances we find, in the very place of the visible objects, those "dynamical qualities" which form the sum-total of our tactual experiences. To Berkeley is due the credit of having first pointed out the original entire disconnection and subsequent intimate blending of the two sets of experience—*visive* and *tactual*; but, if the views here proposed be correct, he erred in supposing that our realization of the geometrical proportions and relations of visible objects, is dependent on the suggestions of touch, and not upon the exercise of a primitive and inherent function of sight. To the popular view, the *objects of sight* have a positive and equal existence in absolute darkness, and are simply rendered visible by the light; whereas, they are, in truth, the light itself variously modified. But, in conclusion, while fully admitting that light and its modifications, viz., color in all its varieties, form the sole objects of sight, we venture to maintain that we only know color by our perception of it, as making up, by its superficial distribution, the visible form and shape of the objects of the outer world; and that this our perception of the shape, relative magnitude, and situation of visible objects is immediate, and strictly regulated by the laws of light in relation to the visual organ, irrespective of, and even in opposition to, tactual experience; but, at the same time, we hold that to the touch alone, we owe our ever-present and ineradicable belief, that these visible appearances have underlying them a materiality which we cannot conceive as actually modified concurrently with those changes of form and magnitude, which are perpetually occurring in relation to our faculty of sight; and therefore, in all questions which relate to real size or distance, we necessarily have recourse in thought to those qualities of matter which are apprehensible by the touch.

That an instinctive power of direct visual perception is possessed by the young of the lower species, is not denied by any; whether a like power has been bestowed upon man, we must now leave to the consideration of the philosophic reader.

See Berkeley's *Theory of Vision*; Wheatstone *On the Physiology of Vision*; review of Berkeley's *Theory of Vision*, by Samuel Bailey; review of the last-named work by J. S. Mill, in his dissertations and discussions; *Sight and Touch*, by T. K. Abbott; Helmholtz's *Popular Lectures*; art. on vision by Sully, in "Mind," Nos. IX. and X.

VISITATIONS. HERALDS', periodical circuits which were in use to be performed by the provincial kings-of-arms in England, in order to take cognizance of the arms, pedigrees, and marriages of the nobility and gentry. A visitation is said to have been held as early as the reign of Henry IV.; but the earliest visitation, in pursuance of a royal commission, was made by Thomas Benolti, Clarencieux, in 1528-29, and comprehended the counties of Worcester, Berks, Oxford, Wilts, Gloucester, and Stafford. From that time, the visitations were repeated at periods varying from 25 to 30 years; never, however, extending to Wales, except on one occasion, in 1581. The latest commission was

dated May 13, 1686, and under it some pedigrees were recorded as late as 1703-4. The cessation of the visitations seems to have arisen from the frequent prohibitions granted by the court of king's bench to stay proceedings in the earl marshal's court, and the abolition of the constable as a permanent officer, in consequence of which the officers-of-arms found it difficult to enforce attendance. The records of the visitations, though not absolutely free from error, contain a mass of historical and genealogical information of great value. They form the principal source of evidence regarding the hereditary right to bear arms in England. The register-books have been scattered among various public and private libraries, including the British museum (which possesses 312 visitation books), the college-of-arms in London, and the Bodleian library. Some of them are no longer extant. A number of the visitations have lately been printed, and others are in the press. A catalogue of the visitations preserved in the British museum was printed by sir N. H. Nicolas in 1825; and an index to the pedigrees and arms in about 250 of the principal MSS. there was published by Mr. Sims in 1849; and an index to all the printed visitations by Mr. George Marshall appeared in 1866.

In Scotland there was no such regular system of visitations. A statute of James VI. (1592, c. 125) empowered Lyon king-of-arms to visit the whole arms used within the realm; and visitations were undoubtedly made in pursuance of this act; but they seem to have been very partial, and no record of them is preserved. Something like a general visitation of Scotland again took place after the restoration, under act 1672, c. 21, the statute instituting the armorial register in the Lyon office, which record was constituted the sole legal evidence of a right to bear arms, and has been continued to the present day.

VISITOR, in the law of England, is one who has a right to inspect the internal government of a corporation or charity. Thus, the ordinary, who is generally the bishop, is the visitor of spiritual corporations. Corporations instituted for private charity and lay foundations are visitable by the founder, or his heirs, or his nominees.

VISOR, or **VIZOR**, otherwise called **BEAUVOIR** or **BRAVER**, the part of the helmet of the middle ages which protected the face. It was perforated to admit light, and movable, so that it could be raised or put down at pleasure. According to the rules established in the later heraldry, the helmet of a knight, when placed over his shield of arms, has the visor up, while that of an esquire has the visor down.

VISTULA, (Lat. *Vistula* or *Visula*, Ger. *Weichsel*, Russ. *Вісла*), an important river of Austria, Poland, and Prussia, rises in Austrian Silesia, near the frontier of Galicia, in a morass in the Jablunka mountains, 15 m. s.e. of Teschen (q.v.), and at the height of 2,000 ft. above sea-level. Formed by three head-waters, the White, the Little, and the Black Vistulas, the Vistula flows n.w. a few miles to the village of Weichsel, where its course is marked by a fall of 180 ft., and thence to the town of Schwarzwasser, where it leaves the mountains. At this point the Vistula turns n.e., and flows in this direction past Cracow, to its confluence with the San, 10 m. below Sandomierz, forming throughout nearly the whole of this part of its course the boundary between Galicia and Poland. From its confluence with the San the river turns to the n., enters Poland, which it traverses in a general n.w. direction, passing Lublin, Warsaw, and Lipno. Leaving Poland it enters the kingdom of Prussia, flowing n.w. to its junction with the Bomberger canal; thence n.n.e., past Kulm and Schwetz, to Graudenz where it turns n. and flows in that direction to its embouchure in the Baltic sea, which it enters by several mouths. About 10 m. below Marienwerder it throws off an arm called the Nogat, which, taking a n.e. direction, and after flowing 32 m., enters the Frisches Haff by about 20 mouths. The main stream continues to flow n. for 115 m., dividing, however, into two branches, one of which flows into the Frisches Haff, the other into the gulf of Dantzic at Weichselmunde, 3 m. below Dantzic. The Vistula receives from the right the Bug, the San, the Dunajec, and the Wieprz; from the left, the Pilza and Brahe. The Vistula is 690 m. in entire length. It becomes navigable at Cracow for small vessels, and for large vessels at the confluence of the San.

VIS VIVA. See **WORK**.

VISWAMITRA is one of the most interesting personages in the ancient history of India. According to the Aitarêya Brâhman'a (see **VEDA**), his father was *Gâthîn*; and in a remoter degree Viswâmitra derived his pedigree from the king *Parâsuras* (q.v.), who was an ancestor of Kus'ika. In the Mahâbhârata, Râmâyan'a, and the Purân'as, his father is called *Gâdhî*, and the origin of the latter likewise traced up to Purûravas; but the distance between the two latter personages is differently filled up in the genealogies given by some of these works. As, according to several accounts, Viswâmitra's sister was *Satyavati*, who married *Richika*, and bore to him *Jamatagni*, he was the maternal grand-uncle of *Puras'urâma* (see **VISIN'U**, the sixth Avatâra). He had 100 sons, 50 of whom were, for an offense they committed degraded by him to become outcasts, and the progenitors of the Andhras, Pun'd'ras, S'abaras, Pulindas, Mât'ibâs, and other frontier tribes, which in the Vedas are called Dasyus, or robbers. Viswâmitra is the author of many hymns of the R'igveda (see **VEDA**), especially of its third, Man'dala; but his fame, which pervades all the periods of Sanskrit literature, is chiefly founded on the remarkable fact, that though by birth a Kshattriya, or a man of the military caste—he is also described as a Ra'ja of Canouj—he succeeded in having himself admitted into the

Brāhmanic caste, after a long contest, which, for this end, he had to wage with the Rishi Vasishṭha (q.v.). That the result of this contest was the elevation of Viśvāmitra to the rank of a Brāhman'a, is the account given in the epic poems and the Purān'as; but as the rivalry between Viśvāmitra and Vasishṭha is already alluded to in several passages of the R̥gveda hymns, and as at their time the caste distinction of later periods of Hinduism was not yet established, it is probable that the later traditions relating to this contest rested on the circumstance, that *Suddās*, a king named in the R̥gveda, who, as is there stated, employed Vasishṭha for his house-priest, allowed, for some unknown reason, also Viśvāmitra to officiate for him at sacrifices, and that the latter, incurring on this ground the jealousy of Vasishṭha, had to maintain, probably by force, the prerogative conferred on him by his royal master. In the epic poems and the Purān'as, the rivalry between these two personages is the subject of several legends, which, considering the relative age of the kings referred to in them, would encompass a period far exceeding that of the lifetime of a human being. A kind of consecutive biography of Viśvāmitra is given in the first book of the Rāmāyan'a, of which it forms one of the most interesting episodes. Its substance is as follows: Once, when roaming over the earth with his armies, Viśvāmitra came to the hermitage of Vasishṭha, and was there received by the saint in the most sumptuous style. Vasishṭha could afford to entertain the king in this manner, because he possessed a fabulous cow of plenty that yielded him everything he desired. Viśvāmitra, becoming aware of the source of Vasishṭha's wealth, strongly wished to possess the cow, and asked Vasishṭha to sell her to him. The saint, however, refusing this offer, the king seized her, intending to carry her off by force. But the cow resisted, and ultimately displayed her supernatural powers in producing from different parts of her body numerous peoples, and by their aid destroying the armies of Viśvāmitra. The king then had recourse to the magical weapons he possessed, but they were defeated by those of Vasishṭha; and to the humiliation thus inflicted on him he then gave vent in exclaiming: "Contemptible is the might of a Kshattriya; a Brāhman's might alone is might." And reflecting on what he should do in this emergency, he resolved to practice austerities in order to attain the rank of a Brāhman. In consequence he went to the s. and performed severe penance during a thousand years; when, at the end of this period, the god Brahman appeared, and announced to him that he had become a Rājārshi, or royal Rishi. But Viśvāmitra, not satisfied with this degree of holiness, continued his austerities for another such period. During that time a king, *Tris'anku* of Ayodhyā (Oudh), of the family of *Ikshvāku*, had conceived the design of performing a sacrifice, that he might boldly ascend to heaven, and solicited for this purpose the assistance of Vasishṭha, who was the family priest of "all the Ikshvākus." This saint, however, having declared the scheme of the king impossible, and his sons too, to whom the king likewise addressed himself, having refused compliance with his wishes, he told him that he would resort to another priest, and was, in consequence, cursed by them to become a man of the lowest caste. In this condition he went to Viśvāmitra; and the latter showed his power by performing the sacrifice, so much desired by Tris'anku, and accomplishing his object, in spite of the resistance of Vasishṭha and his sons, and that of the gods themselves. (The *Hārivaṃśa* relates this story with somewhat different detail, but brings it to the same issue. According to the Vishn'u-Purān'a, which alludes to the version mentioned in the last-named work, Tris'anku was the 28th in descent from Ikshvāku; but in the Rāmāyan'a, there are only five kings between Ikshvāku and Tris'anku.) This event having caused a serious interruption in the austerities of Viśvāmitra, he proceeded to the forest *Pushkara*, in the west, to remain undisturbed. But while he resided there, it so happened that *Ambarisha*, another king of Ayodhyā, intending to perform an expiatory sacrifice, and requiring a human victim for this purpose, after a long search, had bought for immolation from the Brāhman *Richāka*, the brother-in-law of Viśvāmitra, his son *S'unah's'epha*, and was bringing him home to his capital. On his journey, he halted in the forest Pushkara, and when S'unah's'epha there saw his uncle Viśvāmitra, he implored him to come to his rescue. Viśvāmitra first directed fifty of his sons to offer themselves up as a ransom for their cousin, and, on their refusing to do so, cursed them to become outcasts; but afterward taught S'unah's'epha two hymns, which, as he said, if sung by him at the sacrifice, would save his life. (In the genealogy of the Rāmāyan'a, there are twenty-one kings between Tris'anku and Ambarisha; in that of the Vishn'u-Purān'a, fifteen kings; and in the former, between Ikshvāku and Ambarisha, twenty-seven; and in the latter, between Ikshvāku and Ambarisha, the successor of Tris'anku, forty-three kings.) The liberation of S'unah's'epha having been effected, and Viśvāmitra having continued his penance for another thousand years, the god Brahman conferred on him the dignity of a Rishi. But not yet satisfied with this distinction, he went on practicing still fiercer austerities than those he had practiced before. These the gods succeeded in depriving for a time of their spiritual efficacy, by sending him a heavenly nymph, *Menakā*, who excited his worldly passions; still, in the end, he attained the rank of a *Maharshi*, or great Rishi. And, after two other thousand years of still more rigorous penance, which for a time was again interrupted by the allurements of a nymph, *Rambhā*, whom the gods had sent for the same purpose as previously Menakā, the gods, headed by Brahman, came to acknowledge that he had now become a Brahmarshi, or Brāhman'ic Rishi; and Vasishṭha himself was compelled to express acquiescence in the result he had achieved.

For other legends relating to this contest between Visvâmitra and Vasisht'ha, see vol. i. of John Muir's *Original Sanskrit Texts* (Lond. 1858); and the article HARIS'CHANDRA. Compare also VISIN'U, the 7th Avatâra.—The name of Visvâmitra is explained in the Mârkan'd'eya-Purân'a as representing a compound, *vis'wa*, "all," and *amitra*, "no-friend," and meaning "one who is no-friend at all, *scil.*, the three worlds." The Mahâbhârata, however, explains it as *vis'wa*, with its final vowel lengthened, and *mitra*, friend, when it would imply that Visvâmitra was "the friend of all, *scil.*, the gods;" and Yâska, the oldest writer, who gives an etymology of this name, likewise renders it "friend of all." The former etymology would seem the more regular; but as in Vedic *inseparable* compounds the final vowel of the first part is frequently lengthened, the latter etymology is the preferable of the two.

VITACEÆ, also called SARMENTACEÆ and AMPELIDEÆ, a natural order of exogenous plants, of which the common vine may be regarded as the type. About 260 species are known, natives of warm and temperate climates, all shrubs, mostly climbing; with simple or compound leaves, with or without stipules, the lower leaves opposite, the upper ones alternate; the flower-stalks racemose, opposite to the leaves, sometimes (as in the vine), by abortion, changing into tendrils.—The only plant of the order of much value, in an economical point of view, is the vine (*q.v.*), nor are there any fine fruits except its fruit (the grape), and that of species so closely allied to it as to be not improbably mere varieties; but species of the genus *cissus* and of *ampelopsis* (which many unite with *cissus*) are sometimes planted for ornament. *Cissus antaretica* is the KANGAROO VINE of New Holland; and *ampelopsis hederacea*, often called the VIRGINIAN CREEPER, is a frequent ornament of the fronts of houses in Britain, attaching itself to the wall by tendrils terminating in a peculiar kind of sucker, and climbing to a great height.

VITAL STATISTICS. The annual reports of the registrars-general for England and Scotland (see REGISTRATION) form a valuable storehouse of information on the various subjects connected with vital statistics. Besides detailed abstracts for each year of births, marriages, and deaths, tables of the fatal diseases, classified in combination with ages, are given, and comments upon the salient points of the year's registration accompany the whole. The number of births, marriages, and deaths varies with the state of trade, price of food, and the seasons, and thus furnishes a test of the condition of a nation. We shall notice separately each of these three divisions of vital statistics.

1. *Births.*—From the 34th report of the registrar-general for England, it appears that the number of children born alive and registered during the year 1871 was 797,428, the population for the middle of that year being estimated at 22,782,812: the birth-rate being thus 35 per 1000 to the population. The proportion of the sexes was 104 boys to 100 girls. It is found on an average of ten years (1861–71) that Cornwall, North Wales, Northumberland, Cumberland, Rutland, and Northampton have the largest proportion of male births; Hereford and Huntingdon the smallest. The proportion of male children is greater in the illegitimate than in the legitimate births. The registered percentage of illegitimate to the total births in 1871 was 5.6. Twenty years ago the illegitimate were nearly 7 per cent. of the total births; in the ten years 1851–60, the average was 6.5 per cent; in the following ten years, 6.1 per cent. "I have no ground for supposing," says the registrar-general, "that the general diminution in the illegitimate birth-rate is caused by any increase in the omissions to register; on the contrary, I think that, as in those elements of registration which we have the means of accurately observing, undoubted progress in the direction of greater completeness has taken place, it is fair to assume with respect to the registration of illegitimate births, that at any rate no more of them are lost sight of now than in former years." The birth-rate is usually highest in the first three months of the year; taking the mean of each of the quarterly rates during 34 years, the average annual births to 1000 persons living were 35.4 in the March, 35.1 in the June, 32.5 in the September, and 32.3 in the December quarters.

The direct cause of the increase of population in any country (apart from immigration) is, of course, the excess of births over deaths, and this will plainly depend on the following causes: (1) on the prolificness of marriages; (2) on the proportion born which lives to marry; and (3) on the interval between the mean age of marriage and the mean age of death. All these conditions must be favorable to show the full power of increase in action. They have never yet, on any large scale at least, been found operating with maximum force. In the United States we find a combination of the first two; but from the "expectation of life" (see LIFE, MEAN DURATION OF) not being favorable in that country, it follows that the third cause is not in favorable operation.

2. *Marriages.*—It would seem to be contrary to the principles of human nature that early marriages should be united to longevity. Youthful marriages arise where the chances of the acquisition of wealth in youth are favorable; and when these are favorable the fact seems to tell against longevity. One of the most interesting and useful points of view in which registers can be considered is the evidence which they give of the varying prevalence of the prudential check to marriage and population in different countries and places. The prudential check will show itself in two ways—either by the proportion of marriageable persons who are not married, or by the lateness of the average age of marrying. On the supposition of the natural prolificness of women remaining at the same point, the birth-rate will indicate the extent of prudential check in whichever

of the two ways it may manifest itself. Suppose that from any cause the prudential restraint on marriage were to become weaker among any people than it had hitherto been, while the means of maintenance remained the same, what would happen? A corresponding increase would immediately take place in the annual mortality, and the mean duration of life would be correspondingly reduced. And there can be no doubt that the premature mortality which prevails all over the world is mainly owing to imprudent marriages. The death of one-half of the human race under the age of puberty does not take place in virtue of any law of man's constitution, but from a disregard of the admonitions of its laws. Those who have the means of obedience under the conditions of civilized life generally greatly err; yet not so greatly, for the most part, as to be fatal to infant life. It is the want of means, in other words, imprudent marriages, which is the main cause. The following table is taken from an article "On the Statistics of Marriages among the Families of the Peerage," by Archibald Day, esq. (*Assurance Magazine*, No. 48). The results as regards the peerage families are based on the data of a century to Dec. 31, 1855:

PROPORTION PER CENT OF MARRIAGES.

AGES.	Peerage Families.	England. (S. Brown.)		Belgium.	Massachusetts.	Poorer Classes. (St. George's-in-the-East.)	Peerage Families.	1027 Peers. (Sadler.)
	First and Subsequent Marriages.	1846-48.	1851-53.	1841-45.	62 Years, to Jan., 1857.	Statistical Society's Journal.	First Marriages only.	First Marriages only.
Under 30...	53.08	76.77	75.62	52.75	75.01	85.00	65.97	62.81
30 to 45.....	33.98	18.31	19.22	39.93	19.54	14.06	31.63	27.75
45 to 60.....	9.50	4.03	4.15	6.05	4.12	.94	2.40	7.88
60 and upward.....	3.44	.89	.91	1.27	1.33	0.00	0.00	1.56
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In the above, column 1 shows the average rate of marriage at the given ages in the families of the peerage. Thus, of 100 persons married, it will, on an average, be found that 53.08 are under 30 years of age; and so on. Columns 2 and 3 give the same results for all England, as deduced by Mr. S. Brown (see his paper in the *Assurance Magazine*, vol. vii.). Column 4 is from M. Quetelet's observations in Belgium. Column 6 from a report of the committee of the statistical society upon the poorer inhabitants of St. George's-in-the-East in 1845. Column 8 was compiled by Mr. Sadler, and will be found in the second volume of his work on the Law of Population. From the 34th Report of the Registrar-general for England, it appears that in 1871, in England, the number of persons married was 380,224, being 16,914 more than in the previous year, and 26,284 more than in 1869. In the 34 years, 1838-71, the mean annual ratio of persons married was 1.65 per cent; in 1871, the rate was 1.67 per cent. In the five years 1841-45, nearly 92 per cent of the marriages registered were solemnized according to the rites of the established church; in the five years 1866-70, the proportion was 77 per cent; and in 1871 was 76 per cent. On the other hand, marriages in the superintendent registrar's office requiring no religious ceremony whatever, have steadily increased from 2.3 per cent of the total in 1841-45 to 8.9 per cent in 1866-70, and to 9.7 per cent in 1871. The mean age at marriage or remarriage in 1871 was for the men 27.9 years, and for the women 25.7 years. Curious instances are found in the tables of widowers of 60 and 70 marrying maidens of 15 and 19, of a bachelor of 75 wedding a spinster of 21, and of a bachelor of 21 marrying a spinster of 70. At 70 and upward, 238 men and 32 women entered or re-entered into the married state.

3. *Deaths*.—The number of deaths registered in England in 1871 was 514,879, of which 265,563, or 51.6 per cent, were males, and 249,316, or 48.4 per cent, were females. From the census returns of 1871, the male mortality rate in the first five years of life is shown to have been 71.7 per 1000, the female 62.4; at ages five and under ten, these rates were respectively 8.3 and 7.5; at ten to fifteen, when the rates are at their lowest, the male is 4.4, the female 4.5 per 1000; at 15 to 25, the rates are nearly equal, being 7.7 and 7.4; from 25 years of age, both male and female rates increase to the end of life, male being invariably the highest. With regard to cases of reputed centenarianism, the registrar-general points out that while many are recorded, he has as a general rule "no alternative but to tell the tale as it is told to him;" but he notices a case, that of Jacob William Luning, whose death in 1870, at the age of 103, was proved to his, the registrar-general's satisfaction, by documentary evidence. He adds that it is noteworthy that the experience of life assurance societies in this country gives but one example of an insured life completing its hundredth year, and that is the one of Luning. Nearly 13 millions of the population of England live in what are called the town districts, and the death-rate among these in 1871 was 25. per 1000, somewhat above the annual average; among the remaining ten millions inhabiting the villages and rural districts, the rate was 19.5, being somewhat below the average. "For general purposes," says the report, "this comparison may be taken as giving a fair idea of the relative advantages;

as regards the duration of life, which a residence in the country confers over one in town; bearing in mind, of course, that there are special causes of unhealthiness in some country-places, and that the towns themselves have a wide range of death-rate."

When any year is especially healthful, the fact tells most in favor of female life. The highest mortality rate during the 25 years 1838-62, both male and female, occurs in the cholera year 1849, the second highest in the famine year 1847, and the third highest in the cholera year 1854. For the three years 1854-56, it will be found that the mean male mortality is almost exactly that of the 25 years given, while the female rate is actually slightly (.006 per cent) less. With regard, then, to the cholera visitation of 1854 at least, it may be held that the victims must have been generally those of diseased or debilitated constitution, who, had there been no cholera, would in course of the next year or so have died from some other cause. It is a curious fact in the experience of assurance offices, that while female annuitants are longer lived than male, female assured lives are no better. This fact doubtless arises from the critical periods incident to female life, and to the selection exercised by the public against the offices.

In 1871, the Scotch married-rate was 14.2 per 1000, the birth-rate 34.5, and the death-rate 22.2; the marriage-rate was nearly 2.5 per 1000 below that of England, the birth-rates were almost identical, and the death-rate was .4 per 1000 lower in Scotland. The registered rates of persons married, of birth, and of death in Ireland in 1871, were 10.7, 28.1, and 16.5 per 1000 respectively—"these rates," says the report, "differ so widely from those of England and Scotland as to show either that registration in Ireland is extremely defective, or that the constitution or the circumstances of the population is altogether different from that of Great Britain."

In vol. viii. (for 1860) of the *Assurance Magazine* will be found an interesting paper, by Mr. Samuel Brown, F.R.S., "On Mortality amongst American Assured Lives." We extract the following table, showing the

AGE.	"EXPECTATION OF LIFE," ACCORDING TO			
	Mutual Life of New York, Fifteen Years.	"Actuaries," or Seventeen English Companies.	Massachusetts (1855) Tables (Elliott's).	Farr's English, No. 1.
20	42.8	41.5	39.9	39.9
30	36	34.4	34	33.1
40	28.9	27.3	27.9	26.6
50	21.6	20.2	21.3	20
60	14.6	13.8	15	13.6
70	8.6	8.5	9.4	8.5

See also, on the subject of American mortality, the *Report of the Mutual Life Assurance Company of New York, for fifteen years ending Feb. 1, 1858* (New York, Nov. 1859).

Influence of Occupation.—The interesting question of the influence of different trades, occupations and habits of life on health and mortality, will be found ably treated in Mr. A. G. Finlaison's *Report on Friendly Societies*, with accompanying tables and returns, printed by order of the house of commons, Aug. 16, 1853; in Mr. Neison's work on *Vital Statistics* (Lond. 1853); and in Mr. H. Ratcliffe's *Observation of Rate of Mortality and Sickness existing among Friendly Societies* (Manchester, 1850). From Mr. Finlaison, we give the following table, showing the

AGES.	MORTALITY PER CENT AMONG						
	Mariners.	Colliers.	Metal Miners.	Painters.	Police.	Railway Servants.	England and Wales.
20	.66	1.11	.65	...	1.09	....	.74
25	1.71	.77	1.76	1.55	.57	.52	.71
30	1.69	.84	.81	.88	1.35	1.18	.77
35	2.26	1.67	1.02	.87	1.77	1.00	.83
40	1.79	.96	.29	2.04	2.05	1.56	1.03
45	2.71	1.09	2.00	2.09	.68	1.63	1.21
50	2.43	1.70	1.84	2.87	6.35	1.74	1.50
60	2.79	3.96	2.61	6.06	....	5.50	2.61

Among the mariners, a strong contrast is found to prevail between the sickness and mortality rates, the former being low while the latter is high. The same fact is found among painters. "The practical difference in the distribution of sickness," says Mr. Finlaison, "seems to turn upon the amount of the expenditure of physical force. This is no new thing, for in all ages the enervation and decrepitude of the bodily frame has been observed to follow a prodigal waste of the mental or corporeal energies. But it has been nowhere previously established upon recorded experience that the quantum of sickness annually falling to the lot of man is in direct proportion to the demands upon his muscular power. So it would seem to be, however."—*Report*, p. 211.

The following is from Mr. Finlaison's Digest of Returns:

GENERAL AVERAGES.

	Number re- turned as sick out of each 100 persons liable to sickness.	Average sick- ness per an- num to each person, ex- pressed in days.	Average sick- ness per an- num to each person sick, expressed in days.	Mor- tality per cent.	Withdraw- als and exclu- sions per cent.
Light labor <i>without</i> exposure to weather	21.58	9.5489	44.2183	1.42	2.97
Light labor <i>with</i> exposure to weather...	20.80	8.5288	41.0053	1.27	2.82
Heavy labor <i>without</i> exposure to weather	26.54	10.8122	40.7549	1.38	3.08
Heavy labor <i>with</i> exposure to weather...	28.04	10.6537	37.9960	1.07	3.02
England and Wales.....	24.99	10.1155	40.4809	1.26	3.00

In Mr. Neison's work will be found a valuable chapter on the rates of mortality among persons of intemperate habits. The following shows the period of years which there is an equal chance of living among the

AGES.	General population of England and Wales.	Persons of intemperate habits.	
20	44,212	15,557, being 35 per cent.	} of the duration of life in the general population.
30	36,482	13,800, " 38 "	
40	28,790	11,627, " 40 "	
50	21,255	10,860, " 51 "	
60	14,285	8,947, " 63 "	

The average duration of life, after the commencement of intemperate habits, Mr. Neison finds to be—among beer-drinkers, 21.7 years; spirit-drinkers, 16.7 years; indiscriminate, 16.1 years. Hence it appears that distilled liquors are more hurtful than fermented, but that both combined are worse than either taken separately.

The following table, from Mr. Ratcliffe's work, shows the "expectation" at decennial periods of life for England and Wales, Manchester unity order of odd fellows, and various trades:

England and Wales—rural, town, and city; and various trades.	AGE.				
	20	30	40	50	60
England and Wales.....	39.88	33.13	26.56	20.02	13.59
Manchester Unity.....	40.92	33.70	26.41	19.40	13.29
Bakers.....	41.92	34.05	26.58	20.09	14.12
Blacksmiths.....	37.96	30.34	23.52	18.11	13.02
Bricklayers.....	37.70	29.66	22.22	14.78	8.44
Butchers.....	41.60	33.49	26.33	20.32	14.89
Carpenters.....	45.28	38.47	31.65	25.07	18.88
Clerks.....	34.90	27.77	20.61	14.18	12.11
Coopers.....	38.62	31.17	24.23	18.22	13.23
Dyers.....	39.89	32.60	24.73	18.20	13.40
Hatters.....	38.91	34.29	27.93	19.87	12.89
Laborers (town and city).....	40.87	33.65	26.27	19.07	13.33
" (rural).....	45.32	37.71	29.91	22.18	15.82
Millwrights.....	40.32	33.38	27.37	19.60	13.69
Mill operatives.....	38.09	30.45	22.61	15.55	10.61
Miners.....	38.22	31.65	24.28	17.82	12.27
Plumbers.....	38.13	31.59	24.67	18.24	12.67
Potters.....	36.50	30.51	23.80	18.74	13.71
Printers.....	36.66	28.86	20.55	14.67	12.04
Sawyers.....	40.02	33.06	26.05	18.04	13.11
Servants, domestic.....	42.03	34.30	27.32	20.77	14.81
Shoemakers.....	40.87	33.99	26.23	19.04	13.05
Spinners.....	39.04	32.42	24.32	16.62	12.21
Stone-masons.....	38.19	30.41	24.16	18.15	14.79
Tailors.....	39.40	32.51	25.34	18.31	10.23
Weavers.....	41.92	35.55	28.53	22.01	15.61
Wheelwrights.....	40.97	33.87	27.54	19.41	13.84
Wool-combers.....	38.56	33.73	25.96	17.64	13.22

It thus appears that at the early period of life, age 20, the following trades, placed according to their expectation, show an inferior expectation in comparison with the general results of rural, town, and city districts combined: clerks, potters, letterpress printers, bricklayers, blacksmiths, mill operatives, plumbers, stone-masons, miners, wool-combers, coopers, hatters, spinners, tailors, dyers, sawyers, millwrights, town and city laborers, and shoemakers. The following trades show a superior expectation: wheelwrights, butchers, bakers, weavers, domestic servants, carpenters, and rural laborers.

At the last period given in the table, bricklayers, tailors, mill operatives, printers, clerks, spinners, miners, plumbers, hatters, blacksmiths, shoemakers, wool-combers, coopers, and sawyers show an inferior expectation; and dyers, town laborers, millwrights, potters, wheelwrights, bakers, stone-masons, domestic servants, butchers, weavers, rural laborers, and carpenters show a superior expectation in comparison with the general results.

The comparative healthiness of various occupations among the lower ranks in London is given by Dr. Letheby for the years 1855-56; and another view of the healthiness or unhealthiness of industrial occupations as regards England generally, is given by Dr. Farr from the mortality of males at and above the age of 20 following different industrial occupations, in 1851, as compared with the number of persons enumerated in them at the census of that year. While the general annual rate of mortality in England, in 1851, of 1000 males at and above the age of 20, was 20, that of farmers was 28; shoemakers, 18; weavers, 17; grocers, 11; blacksmiths, 18; carpenters, 19; tailors, 19; laborers, 21; miners, 15; bakers, 17; butchers, 21; innkeepers, 30. Taking into account the ages at death, the farmers were the longest lived. Laborers, who form nearly a fourth of the males of England, had a general mortality almost the same as that of the general population, but a very high mortality at great ages. At any one decade of life, the mortality of inn and beer-shop keepers exceeds that of all the other classes, except the butchers, at age 55-65. The mortality of butchers was much heavier than that of any other class, except that of innkeepers, under the age of 65; this fact is supposed to be owing to intemperance, slaughter-house effluvia, and the use of too much animal and too little vegetable food. All occupations have their peculiar dangers which counter-balance each other; thus the tailor is not exposed to the explosions so fatal to the miner, and the laborer has exercise denied to the tailor.

The mortality in the army and navy during peace and war shows many interesting points. Statistics tell us that soldiers, though picked men, living in costly barracks in Britain during peace, are nearly as unhealthy as the people of our unhealthiest cities, and sometimes almost twice as unhealthy. The mortality at all ages in the army at home is almost double that of civilians, ages being alike. Lung diseases and cholera are twice as fatal to soldiers as to civilians. This excessive mortality in the army seems owing to overcrowded and ill-ventilated barracks and military hospitals, sameness of diet, and want of healthy exercise. In 1871, the strength of the entire British army abroad as well as at home was 192,665, of whom 105,757 were serving in the United Kingdom, and the remaining 86,908 were distributed in different parts of the world. The deaths occurring in the year out of the above numbers were 1005 at home, and 1322 abroad, making altogether 2,327. Proportionately to each 1000, there were at home 11.9 deaths of officers, and 9.4 of non-commissioned officers and men; abroad 11.4 deaths of officers, and 15.4 of non-commissioned officers and men. The mean annual mortality of officers in the six years 1866-71, was at the rate of 10.5 deaths per 1000 at home, and 13.6 abroad; among non-commissioned officers and men, the corresponding rates were 11.2 at home and 18.3 abroad. Of the army at home, the mortality rate was considerably less among the 1216 officers stationed in Ireland than it was among the 3,664 officers stationed in Great Britain. Of non-commissioned officers and men, 26,437 were stationed in Ireland, and their mortality rate was 8.5 per 1000, while it was 9.7 among the 74,440 stationed in Great Britain. "As the condition of the mercantile marine," says the registrar-general, "is just now engaging a good deal of public attention, it may be worth while to see how that service compares in point of mortality with the naval service, and the general home population of corresponding age." The mean age, it appears, of the men afloat in the merchant service is about 28 years, while that of the men in her majesty's navy is about 26, so that there is really little difference in age between the two. Now the mortality among the English male population at age 28 is by the "English Life Table" 9.7 per 1000; in the navy, the average annual rate of mortality in the period 1856-72, was 14 per 1000; in the merchant service, from 1852-71, it was 21 per 1000. The following table gives a comparison of the death-rate in the royal navy, and in the merchant service from disease and from accident:

	Deaths per 1,000.	
	Royal navy, annual average, 1856-72.	Merchant service, 1871.
From disease	10.	6.8
From injury or accident (including drowning)	4.	14.9
All causes.....	14.	21.7

Thus it appears that in the navy about two-thirds of the deaths are the result of disease, while in the merchant service two-thirds of the deaths are the results of causes other than disease. Among the home population, at the sailors' ages, the mortality from all kinds of violence does not exceed 1 per 1000. The dangers of the sea are now in the navy 4 times, and in the merchant service 15 times as great as the dangers on land.

Mortality varies with density of population, place, and climate. It is a popular notion that a mild winter is most fatal to life, but the truth is the reverse. Either extreme cold or extreme heat immediately raises the mortality rate of Great Britain; the injurious effect of cold is in a great measure, however, confined to those whose circumstances do not enable them to protect themselves against it.

Some years ago, ten of the principal life-insurance offices of Scotland, with several of the leading English offices, contributed their experience down to Dec. 31, 1863, as a

basis of investigation into the mortality of assured lives. In England, the scheme was under a committee of the institute of actuaries; in Scotland, it was in charge of Mr. James Meikle, actuary of the Scottish provident life assurance society. It was completed with much care, and a valuable and elaborate work illustrative of its scope was published by Mr. Meikle in 1872.

VITAL STATISTICS (*ante*). The following table gives the number of deaths in the city of New York for 7 years preceding 1880, with the average number of deaths for 6 years previous to 1879:

CAUSES OF DEATH.	ACTUAL NUMBER OF DEATHS FOR THE YEAR ENDING—							Average number of deaths for 6 years.	Annual death-rate per 1,000; est. av. pop. 1,171,740.
	Dec. 31, '79.	Dec. 31, '78.	Dec. 31, '77.	Dec. 31, '76.	Dec. 31, '75.	Dec. 31, '74.	Dec. 31, '73.		
Total deaths from all causes	28,342	27,008	26,203	29,152	30,709	28,727	29,084	28,480.5	24.19
Total zymotic diseases	7,994	7,648	8,042	9,560	10,908	9,712	9,497	9,227.2	6.82
Total constitutional diseases	6,417	6,436	5,800	6,072	6,089	6,021	6,392	6,118.2	5.30
Total local diseases	11,082	10,213	9,730	10,602	10,761	9,992	10,265	10,269.3	9.46
Total developmental diseases	1,844	1,701	1,615	1,750	1,762	1,753	1,870	1,741.8	1.57
Deaths by violence	1,005	1,010	1,026	1,108	1,186	1,249	1,160	1,123.2	.86
Small-pox	25	2	14	315	1,280	484	117	368.7	.02
Measles	244	272	155	362	167	319	306	263.5	.21
Scarlatina	1,477	1,039	983	891	514	879	1,045	901.8	1.26
Diphtheria	671	1,007	951	1,750	2,329	1,665	1,151	1,475.5	.57
Membranous croup	522	499	472	527	758	594	732	597.0	.45
Quinsy (tonsillitis, angina maligna, etc.)	6	12	16	22	17	42	47	26.0	.005
Whooping-cough	537	382	440	406	407	489	268	398.7	.46
Parotitis	4	5	4	8	3	3	9	5.3	.003
Erysipelas	145	145	128	124	170	169	204	156.7	.12
Typhus fever	4	4	17	20	28	14	39	20.3	.003
Typhoid fever	178	245	275	283	347	275	234	286.5	.15
Cerebro-spinal fever	108	97	116	127	146	158	230	155.7	.09
Remittent, intermittent, typho-malarial, congestive, and simple continued fevers	390	361	318	237	275	295	282	294.7	.33
Puerperal diseases	359	300	298	342	370	393	427	355.0	.23
Diarrheal diseases	2,965	2,945	3,557	3,782	3,738	3,569	4,097	3,614.7	2.31
Inanition, want of breast-milk, etc.	226	193	268	367	356	311	224	286.5	.19
Purpura	15	18	15	21	26	22	19	60.2	.01
Alcoholism	198	127	100	126	168	227	254	167.0	.17
Anæmia	34	23	21	40	37	23	17	26.8	.03
Rheumatism and gout	171	140	145	147	178	176	194	103.3	.15
Syphilis	193	149	127	123	126	146	160	139.5	.16
Cancer	572	570	495	459	423	416	425	464.7	.49
Hydrophobia	2	2	4	5	5	5	5	2.7	.001
Phthisis pulmonalis	4,343	4,466	4,044	4,194	4,172	4,031	4,134	4,174.0	3.71
Laryngitis	34	34	29	88	157	130	92	89.3	.03
Bronchitis	1,263	1,184	1,033	1,214	1,111	1,065	1,068	1,112.5	1.08
Pleurisy, hydrothorax, and empyema	84	86	79	61	99	92	98	86.0	.07
Pneumonia	2,554	2,288	2,148	2,542	2,802	2,508	2,328	2,417.7	2.18
Emphysema and asthma	73	62	77	66	62	72	62	66.8	.06
Heart diseases	1,164	1,068	879	992	985	882	860	944.5	.99
Aneurism	77	87	94	74	86	76	76	82.7	.07
Marasmus—tabes mesenterica and serofula	646	588	532	532	503	635	713	598.8	.55
Aphthæ	13	12	18	36	32	21	13	22.5	.01
Hydrocephalus and tubercular meningitis	609	604	514	613	599	627	682	606.5	.53
Rachitis	30	26	17	25	36	18	20	22.7	.03
Meningitis and encephalitis	568	612	606	752	710	616	776	683.7	.52
Convulsions	606	630	684	685	662	671	714	674.3	.48
Direct effect of solar heat	41	52	21	206	19	19	34	58.5	.04
Insanity	66	52	60	56	34	59	55	52.7	.06
Apoplexy	489	447	350	383	368	432	455	405.8	.42
Epilepsy	96	69	65	64	61	65	69	65.5	.08
All diseases of the brain and nervous system	2,486	2,410	2,378	2,663	2,436	2,451	2,811	2,524.8	2.12
Disease of the spine	44	30	39	31	23	26	38	31.2	.04
Cirrhosis of liver and hepatitis	257	223	248	295	282	243	257	259.8	.22
Dyspepsia	39	54	19	22	33	25	25	29.7	.03
Enteritis, gastro-enteritis, peritonitis, and gastritis	517	514	591	537	545	576	608	561.8	.47
Bright's disease and nephritis	1,348	1,161	1,139	1,132	1,107	975	985	1,083.2	1.15
Diabetes	37	42	35	19	31	13	13	25.7	.03
Cyanosis and atelectasis	271	243	222	233	218	205	201	220.7	.23
Premature and pre-natural births	612	576	545	592	613	609	654	598.2	.55
Surgical operations	39	21	32	114	125	112	94	89.7	.04
Deaths by suicide	117	142	148	150	155	180	118	148.8	.10
Deaths by drowning	119	185	194	195	182	191	159	184.3	.13
Deaths of Under 1 year of age	7,570	7,100	7,419	8,170	8,540	8,249	8,678	8,031.0	6.46
of " 2 years " "	10,088	9,716	9,914	11,245	11,676	11,097	11,411	10,843.2	8.61
Children " 5 " "	12,777	12,410	12,307	14,210	14,848	13,956	14,182	13,652.2	10.90

COMPARATIVE TABLE OF VITAL STATISTICS OF AMERICAN AND SEVERAL FOREIGN CITIES
FOR THE YEAR 1879.

CITIES.	Population by Census.	When taken.	Est. Pop. July 1, 1878.	Births Re- ported.	Marriages Re- ported.	Still-Births Reported.	Total Number of Deaths.	Annual Death rate per 1,000 of Pop.
AMERICAN.								
New New, N. Y.	1,041,886	1875	1,171,740	25,573	8,446	2,161	28,242	24.19
Philadelphia, Penn.	817,448	1876	901,380	18,430	5,221	879	15,433	17.17
Brooklyn, N. Y.	482,493	1875	564,448	10,169	3,322	829	11,590	20.40
St. Louis, Mo.	488,000	1876	500,000	4,641	1,375	541	6,167	12.33
Baltimore, Md.	267,354	1870	275,000	7,615	2,077	620	7,618	20.31
Boston, Mass.	341,919	1875	265,000	10,300	3,436	457	7,425	20.37
Cincinnati, Ohio.	216,339	1870	280,000	7,332	1,434	359	5,390	18.89
San Francisco, Cal.	149,473	1870	305,000	1,476	2,536	268	4,311	14.13
Louisville, Ky.	100,753	1870	175,000	.....	.....	187	2,436	13.77
District of Columbia.	131,700	1870	170,000	3,913	944	370	4,166	24.62
Milwaukee, Wis.	71,440	1870	124,000	.....	.....	198	1,965	15.55
Providence, R. I.	100,675	1875	102,500	2,322	1,071	122	2,026	19.77
Richmond, Va.	72,680	1875	80,000	1,912	582	171	1,668	20.10
Burlington, Vt.	14,387	1870	16,500	312	92	16	212	12.85
Utica, N. Y.	32,070	1875	35,000	727	118	31	441	12.69
Dayton, Ohio.	34,473	1870	37,654	1,029	.....	51	539	14.51
Toledo, Ohio.	31,584	1870	50,000	345	489	46	737	14.54
Yonkers, N. Y.	17,460	1875	20,000	355	90	22	287	11.25
Savannah, Ga.	28,335	1870	32,656	.....	.....	86	1,102	23.15
Lynn, Mass.	52,660	1875	34,200	.....	.....	38	642	18.72
Wilmington, Del.	20,841	1870	41,000	.....	.....	37	871	19.80
Taunton, Mass.	18,622	1870	20,200	422	153	11	361	17.87
New Albany, Ind.	15,396	1870	17,500	.....	.....	12	288	16.46
Salt Lake, Utah.	12,854	1870	25,000	.....	.....	9	514	20.56
San Antonio, Texas.	12,256	1870	20,000	.....	287	8	532	26.15
Allegheny, Penn.	53,180	1870	75,000	593	216	54	1,022	13.63
Newburyport, Mass.	12,535	1870	13,500	263	125	5	303	22.44
Livinghamton, N. Y.	15,518	1875	18,000	.....	.....	12	256	14.22
Salem, Mass.	25,958	1875	26,400	739	227	17	518	19.62
Hudson County, N. J.	163,000	1875	188,000	3,579	993	265	3,826	19.32
St. Paul, Minn.	20,030	1870	?	.....	.....	.....	526	26.36
Lurlington, Iowa.	14,560	1870	?	214	.....	9	168	11.35
Syracuse, N. Y.	48,255	1875	.....	.....	.....	55	730	11.92
Newburgh, N. Y.	17,322	1875	17,598	145	100	9	319	18.37
Aurora, Ill.	11,162	1870	14,500	.....	.....	.....	172	11.82
Indianapolis, Ind.	48,344	1870	100,700	.....	.....	.....	1,476	914.60
New Bedford, Mass.	21,320	1870	27,200	.....	.....	.....	683	25.21
Evansville, Ind.	23,000	1870	25,000	.....	526	50	575	14.43
Augusta, Ga.	27,012	?	27,012	.....	.....	41	656	24.29
FOREIGN.								
Marseilles, France.	218,868	1876	?	5,705	2,237	728	10,266	32.32
Paris, " "	1,988,806	Dec. 1, 1876	.....	56,229	18,006	4,377	51,065	25.69
Hayre, " "	92,068	1876	92,068	3,100	811	179	3,148	34.19
Glasgow, Scotland	400,442	Apr. 2, 71	539,675	19,747	.....	.....	12,450	29.07
Edinburgh, " "	201,652	Apr. 3, 71	236,075	7,400	1,901	.....	4,420	19.50
Frankfort-on-the-Main, Ger.	103,136	Dec. 3, 75	126,000	4,250	1,300	166	2,715	21.55
Belgrade, Servia	27,005	1874	.....	420	427	.....	1,055	38.22
Dresden, Germany.	197,235	1875	215,440	7,782	2,025	569	5,715	21.02
Hamburg (including Terri- tory), Germany	417,399	Dec. 1, 78	.....	16,760	4,041	670	11,668	26.53
Cologne, Germany	135,371	Dec. 1, 75	140,872	5,432	1,189	223	3,713	26.36
Montreal, Canada	?	?	135,000	.....	.....	.....	3,504	27.44
Kingston-upon-Hull, England	?	?	140,347	5,779	?	?	3,235	22.10
Havana, Cuba	195,437	1877	?	?	?	?	9,052	46.32
Liège, Belgium	115,300	?	?	3,750	1,044	183	2,677	23.22
Bruges, " "	48,498	?	?	1,286	296	10	1,398	28.53
Trieste, Austria	126,633	1875	128,333	4,929	1,107	323	5,039	35.63
Prague, Bohemia.	157,713	Dec. 31, '69	171,480	6,099	1,311	309	5,048	29.36
London, England.	3,254,260	1871	3,620,868	134,096	33,452	.....	85,540	23.62
Liverpool, " "	403,405	1871	528,338	20,814	.....	.....	14,502	36.94
Dublin, Ireland	314,666	1871	?	9,393	.....	.....	11,335	35.70
Belfast, " "	182,882	1871	?	6,987	.....	.....	5,008	30.66
Brussels, Belgium.	175,782	?	?	5,630	1,575	290	4,235	24.38
Antwerp, " "	162,547	Dec. 31, '76	172,000	6,424	1,396	284	4,477	26.03
Buda-Pesth, Hungary	309,208	Jan. 1, '76	323,659	13,080	2,822	619	12,139	37.51
Berlin, Germany	966,858	Dec. 1, '75	1,062,500	44,214	10,431	1,848	29,541	27.80
Vienna, Austria.	607,514	Dec. 31, '69	737,285	28,281	5,772	1,380	21,062	28.57
Copenhagen, Denmark.	222,500	.....	222,554	8,444	2,044	218	5,998	25.79
Stockholm, Sweden	152,825	.....	.....	.....	.....	.....	3,442	22.52
Christiania, Norway	112,977	.....	.....	4,429	.....	.....	1,966	17.40
Amsterdam, Holland.	308,952	.....	.....	11,285	.....	.....	7,563	24.48
Rotterdam, " "	117,002	.....	.....	5,500	.....	.....	3,672	21.02
The Hague, " "	111,016	.....	.....	4,333	.....	.....	2,755	24.82
Calcutta, India	429,535	Apr. 6, '76	429,535	6,409	.....	429	13,044	30.37
Bombay, " "	644,405	.....	.....	.....	.....	.....	22,471	34.87
Madras, " "	397,552	.....	.....	16,153	.....	.....	13,661	34.36
Basel, Switzerland	44,824	1870	50,470	2,034	563	77	1,316	26.07
Bern, " "	36,001	1870	41,814	1,527	363	86	1,314	31.42

VITAL STATISTICS OF AMERICAN AND FOREIGN CITIES—Continued.

CITIES.	Population by Census.	When taken.	Est. Pop. July 1, 1874.	Births Re- ported.	Marriages Re- ported.	Still-Births Reported.	Total Number of Deaths.	Annual Death- rate per 1000 of Pop.
<i>FOREIGN—Continued.</i>								
St. Petersburg, Russia.....	669,741	1869	.....	.....	.....	.....	25,990	38.81
Warsaw, Russian Poland.....	315,199	.....	.....	.....	.....	.....	8,111	25.73
Odessa, Russia.....	177,700	.....	.....	.....	.....	.....	6,731	37.91
Portsmouth, England.....	.....	.....	131,821	4,347	.....	.....	2,239	16.67
Birmingham, ".....	.....	.....	388,884	15,849	.....	.....	8,766	22.12
Leicester, ".....	.....	.....	125,632	4,788	.....	.....	2,758	21.54
Nottingham, ".....	.....	.....	169,396	6,193	.....	.....	3,891	22.54
Manchester, ".....	.....	.....	361,819	13,345	.....	.....	9,882	26.80
Leeds, ".....	.....	.....	311,860	11,637	.....	.....	7,150	22.49
Sheffield, ".....	.....	.....	297,138	10,822	.....	.....	6,422	21.21
Rome, Italy.....	294,437	.....	.....	7,961	.....	.....	6,712	22.86
Naples, ".....	458,614	.....	.....	16,554	.....	.....	13,429	29.28
Milan, ".....	288,300	.....	.....	.....	.....	.....	8,509	29.51
Alexandria, Egypt.....	212,034	.....	.....	8,335	.....	.....	7,744	36.32
Melbourne and suburbs, Vic.....	206,780	Apr. 2, 71	265,000	8,829	2,350	.....	5,096	19.23
Sydney, New South Wales.....	76,159	1871	107,603	3,714	1,417	.....	2,266	21.06
Hanover, Germany.....	123,744	.....	.....	4,225	.....	.....	2,483	20.07
Bremen, ".....	105,000	.....	.....	4,044	.....	.....	2,379	22.44
Wiemar, ".....	19,921	.....	.....	546	.....	.....	330	16.57
Bernburg, ".....	19,300	.....	.....	687	.....	.....	447	23.16
Göttingen, ".....	18,200	.....	.....	576	.....	.....	483	26.54
Aschersleben, ".....	17,975	.....	.....	772	.....	.....	401	22.31
Quedlinburg, ".....	17,760	.....	.....	632	.....	.....	445	25.06
Wissenfels, ".....	18,617	.....	.....	813	.....	.....	500	26.86
Eisenach, ".....	17,135	.....	.....	661	.....	.....	389	22.70
Naumburg a. S., ".....	17,276	.....	.....	559	.....	.....	384	22.23
Coburg, ".....	16,096	.....	.....	445	.....	.....	304	18.89
Leipsc, ".....	145,719	.....	.....	4,949	.....	.....	3,419	23.46
Parish of Kingston, Jamaica.....	34,314	1871	37,847	1,087	.....	.....	1,102	37.05
" St. Andrew, ".....	31,683	1871	34,944	1,273	.....	.....	948	27.13
" St. Thomas, ".....	32,673	1871	36,036	1,032	.....	.....	824	22.87
" Portland, ".....	25,313	1871	27,918	1,069	.....	.....	565	20.27
" St. Catherine, ".....	53,972	1871	59,528	1,752	.....	.....	1,424	23.92
" St. Mary, ".....	36,495	1871	40,252	1,314	.....	.....	876	21.76
" St. Ann, ".....	39,547	1871	43,618	1,580	.....	.....	867	19.88
" Clarendon, ".....	42,747	1871	47,147	1,632	.....	.....	950	20.73
" Manchester, ".....	38,925	1871	42,932	1,675	.....	.....	802	18.63
" St. Elizabeth ".....	45,200	1871	49,853	1,967	.....	.....	1,061	21.23

VITEBSK, a government in the n. of West Russia, bounded on the n.w. by Courland and Livonia, and on the n.e. by the government of Pskov. Area, 17,425 sq.m.; pop. 70,888,727. The surface is, as a rule, hilly, though wooded plains, marshes, and lakes abound. The Dwina flows for 466 miles in this government; and by means of this river and its affluents, large quantities of timber are floated down to the port of Riga. The soil is not fertile, the quantity of cereals grown being generally insufficient for local consumption. Flax is successfully grown; and this material, together with timber, constitutes the chief articles of export. Ship-building is carried on on the Dwina; the lake-fisheries are profitable; and tanning is the most important branch of industry.

VITEBSK, a city of West Russia, capital of the government of the same name, on both banks of the Western Dwina, 389 m. s. of St. Petersburg. It covers a very large area, and contains many monasteries, churches, and synagogues. Manufactures are not extensive; and the trade—the chief articles of which are corn, flax, hemp, tobacco-leaves, sugar, and timber—is carried on by Jews, who form the larger section of the population. Vitebsk is connected by railway with Dünauburg and Smolensk. Pop. '67, 28,944.

VITELLIN. This name was, until recently, given by chemists to a supposed protein body occurring in the yolk of egg. It has been discovered by Lehman that this substance is merely an admixture of casein and albumen.

VITELLIUS, AULUS, Roman emperor, son of Lucius Vitellius the prince of the sycophants who surrounded Caligula, but who, according to Tacitus, "in his provincial administration exhibited the virtues of a former age," was born Sept. 24, 15 A.D., and through his father's influence at court became consul, 48 A.D., and afterward proconsul of Africa, where his administration gave great satisfaction. He had been a companion of Tiberius at Caprea, and was equally a favorite with Caligula, Claudius, Nero, and Galba, the last of whom appointed him commander of the legions in Lower Germany, thinking his intense devotion to gastronomic pleasures would effectually prevent his becoming a rival. However, Vitellius had not been a month in his new post, till he

had completely gained the affections of his soldiers by extreme familiarity and liberality (strongly contrasting with Galba's parsimony); and on Jan. 3, 69, they took him from his tent, and proclaimed him emperor. This decision was adopted by the rest of the troops in Gaul; and two armies, under Valens and Cæcina, immediately set out to secure Rome, Vitellius following leisurely. A notice of his contest with Otho in Northern Italy will be found under OTHO. The adherents of his predecessor were leniently treated, with the exception of the centurions of Otho's army, who were put to death, an act which greatly offended his own supporters. Vitellius's journey to Rome was a curious specimen of a triumphant advance, the nominal conqueror being invariably muddled with liquor, and the soldiers of his army straggling about, committing excesses of all sorts with perfect impunity. At last he reached Rome, and without loss of time, proceeded, by right of his office as Pontifex Maximus, to deify Nero. The administration was mostly in the hands of the freedman Asiaticus, though P. Sabinus (brother of Vespasian), and the two generals who had gained for him the imperial dignity, were high in authority; and the government was marked by great moderation, for Vitellius was too far sunk in the vilest debauchery to be capable of tyranny. But he was not long allowed to disgust the respectable part of the citizens of Rome; for the legions of Pannonia and Illyricum, having proclaimed Vespasian emperor, advanced into Italy under Antonius Primus. They were opposed by the Vitellian troops, commanded by Cæcina, but through the treachery of the latter general, gained a decisive victory near Bedriacum, and another, on the following evening, over another Vitellian army which had marched to the support of the first. Vitellius, at this critical period of his fortunes, nothing abated his swinish indulgences; but his brother, Lucius, in the south, displayed more energy, and defeated Vespasian's partisans in several battles. Meantime, the soldiers, enraged at the treachery of P. Sabinus, and his allies among the senators and knights, stormed the Capitol, and slew Sabinus. From this time, Rome was a scene of unintermitting violence and bloodshed till the troops of Primus entered the city. Vitellius was found wandering about his palace in a state of stupid terror, and after being ignominiously exposed in the streets, was killed by repeated blows, his head carried about Rome, and his body thrown into the Tiber, in Dec. 69 A.D.—For a complete sketch of his private life, see Tacitus's *Historia*, ii., iii., and Dion Cassius, 65; see also Suetonius, *Vit. Duodec. Cæs.*

VITELLUS O'VI, or the *yelk* of the egg of the domestic fowl, is employed in pharmacy for the purpose of administering substances insoluble in water (the oils and resins, for example) in the form of emulsions. The *white* is employed as an antidote, in cases of poisoning by corrosive sublimate or with salts of copper. As a dietetic article in the sick-room, eggs, either lightly boiled or poached, or as ingredients of puddings, are invaluable; the stomach, after an acute disease, being often able to digest an egg, when any more solid article of animal food would set up gastric irritation.

The article **EGG, CHEMISTRY OF**, requires a few supplementary remarks. The albumen, occurring in the *white*, is for the most part in combination with soda; in addition to this principal ingredient, the white contains fats (chiefly margarin), grape-sugar (averaging 5 per cent of the dried residue), and soluble salts, in which the chlorides preponderate, with a little silica (for the formation of feathers) and fluorine. The yelk consists of casein (forming 14 per cent), albumen (about 3 per cent), fats, some of which contain phosphorus (about 30 per cent), a little grape-sugar, and mineral constituents (about 1.5 per cent), in which there is a great preponderance of potassium compounds and phosphates. Of the pigments of the yelk we only know that there is both a yellow and red pigment, and that one at least of them contains iron. It is difficult to conceive a more concentrated form of nourishment than a food thus composed of casein, albumen, fat, sugar, potassium salts, phosphates, and iron; and its resemblance in composition to milk is very remarkable.

The shell of the egg consists almost solely of carbonate of lime (about 97 per cent), with a little phosphate of lime, and traces of magnesia and organic matter. The variety of color in the eggs of different birds is supposed to be due to certain modifications of bile-pigment with which they come in contact in the cloaca.

VITERBO, a city in central Italy, in the province of Rome, stands amid gardens and vineyards, at the foot of monte Cincino, 42 m. n.n.w. of Rome. Its well-built streets are paved with marble, and there are numerous elegant fountains. Its Gothic cathedral contains the tombs of several popes, and is memorable as the scene where Guy de Montfort assassinated prince Henry, brother of Henry III. of England. Among other attractive buildings are the churches, mostly rich in works of art, the bishop's palace, and the city halls. There are many monuments of antiquity in and around the city. Alum, vitriol, and sulphur abound in the neighborhood, and exquisite wines are produced. No important manufactures are carried on. Pop. '71, 16,326.

VITEX, a genus of trees or shrubs of the natural order *verbenaceæ*, the fruit a drupe, with a 4-celled stone. *V. agnus castus*, the CHASTE TREE, a native of the countries around the Mediterranean, is downy, with digitate leaves white on the back, and has an acrid fruit, the seeds of which are used in Smyrna as an external application in cases of colic. It derives its name from the practice of Grecian matrons to strew their couches with its leaves, especially during the sacred rites of Ceres, in order to banish impure

thoughts; for which purpose a syrup, made of its fruit, was also, and perhaps still is, used in convents in the s. of Europe, although, in reality, it possesses stimulating properties.—*V. negundo*, an Indian species, has aromatic leaves, which are bruised and applied to the temples for relief of headache.—*V. trifolia* is another Indian species, whose leaves are a powerful discutient.

VITILIGO was the name given by Celsus to some kind of cutaneous eruption which cannot be clearly identified. The term has, in recent times, been used by different writers in different senses, but is now most commonly employed to designate cutaneous patches characterized by loss of pigment.

VITIOUS INTROMISSION, in the law of Scotland, means the unwarrantable interference and management of the movable estate of a deceased person. The consequence is, to make the intromitter liable for all the debts of the deceased person, though far exceeding the value of the assets. The mode of putting an end to this liability is to obtain confirmation as executor in the usual way.

VITORIA, a pleasant, gay, and thriving inland t. in the n. of Spain, capital of the province of Alava, stands on a gentle elevation, 70 m. w. of Pamplona. The old town, the Villa Suso, consists of dark and tortuous streets; the new town is regularly laid out. There are several charming *alamedas*, or public walks, especially La Florida and El Prado. The plaza Nueva, a square of 220 ft., was built in 1791, and under its arcades is the favorite promenade in winter. Brass and iron wares, earthenware, candles, and linen goods, are manufactured, and a brisk general trade is carried on with towns further inland. The plain surrounding the town is extensive and fruitful. The climate is temperate and healthy. Pop. 18,700.

Vitoria will be ever memorable for the decisive and important victory which Wellington gained here over the French under Joseph Bonaparte and Jourdan, June 21, 1813. The numbers in this encounter were nearly equal. The French lost 6,000 killed and wounded, 150 cannon, together with baggage, eagles, and an amount of booty in pictures, etc., which amounted to 5,000,000 dollars. The direct result of the battle of Vitoria was, that the French had to retire from Spain. About this engagement, Southey says the French "were beaten before the town, in the town, through the town, out of the town, behind the town, and all about the town." The loss of the British, Portuguese, and Spaniards was 4,900 men.

VITRÉ, an ancient t. of Brittany, France, in the department of Ille-et-Vilaine, on the left bank of the Vilaine, 24 m. e. of Rennes by railway. It is a curious specimen of the old towns of the middle ages, and is still surrounded with Gothic ramparts flanked with towers. At 3 m. distant is the château des Rochers, the celebrated residence of Mme. de Sévigné. Manufactures of cloth and hats are carried on. Pop. 76,847.

VITRIFIED FORTS, the name given to certain remarkable stone inclosures bearing traces of the action of fire, about fifty of which exist in various parts of Scotland. They are generally situated on a small hill, overlooking a considerable valley, and consist of a wall, which may have originally been about 12 ft. in height, inclosing a level area on the summit of the hill. The most remarkable feature of these structures is, that the wall is always more or less consolidated by the action of fire—in some cases only to the extent of giving a glassy coating to its inner side, while in other instances the vitrification has been more complete, the ruins assuming the character of vast masses of coarse glass. Structures of this kind are to be found at Noath and Dunnideer, in Aberdeenshire; Craig Phadrick, Tordun, and Glenever, in Inverness-shire; Knockfarril, in Ross-shire; Creich, in Sutherland-shire; Dunskeig, in Argyshire; Finhaven, in Forfarshire; and elsewhere, but principally in the northern counties. They were first noticed by Mr. John Williams, in his *Account of some Remarkable Ancient Ruins lately discovered in the Highlands and Northern Parts of Scotland*, published in 1777. Mr. Williams's observations led him to conclude that they were artificial structures intentionally vitrified by a partial melting of their materials. Mr. Williams's views were combated by other writers, who contended that the supposed forts were of volcanic origin, a supposition quite irreconcilable with their obviously artificial character. In 1828 the subject engaged the attention of the society of antiquaries of Scotland, a series of careful observations being made by Dr. Samuel Hibbert, one of the secretaries of that body; and the conclusion arrived at was, that while the structures were artificial, the vitrification was an accidental effect, which might have arisen from such causes as the frequent kindling of beacon fires as signals of war and invasion, or of bonfires forming a part of festive or religious rejoicings. The alkali produced from the accumulation of the ashes of continually blazing wood-fires would be a powerful aid to the fusion of stone. The view originally taken by Mr. Williams has since been supported by Dr. John McCulloch, who argues that the character of the works shows them to have been designed for defensive military posts, and observes, that in some cases where the most accessible materials for a stone-fort are incapable of vitrification, stones more capable of being vitrified have been brought from a distance. Dr. Petrie has noted one vitrified fort in the county of Cavan, and four in the county of Londonderry, and he conjectures that they belonged to the Irish Picts. A single instance, that of the "camp of Péran" in Brittany, occurs in France. In this case, only the central portion, or core, of the wall is vitrified, and in it

a Roman roofing tile was found by M. Lukis firmly attached to the melted stone. A number of the hill-forts of Bohemia have also been found to be constructed with a core of vitrified stones occupying the center of the walls. Dr. Fölisch attributes them to the bronze age and to a Celtic race. More detailed descriptions of these Irish, Breton, and Bohemian examples, however, are necessary to enable us to pronounce definitely as to their identity with those of Scotland. But there seems to be little doubt that the vitrification in them all was the work of design, though produced, it may be, by different methods, and with structural intentions not quite the same.—See *Archæologia Scotiæ*, vol. iv.; McCulloch's *Highlands and Western Islands of Scotland*; Burton's *History of Scotland*, chap. 3; *Proceedings Soc. Antiq. Scot.*, vol. viii. p. 145.

VITRINGA, CAMPEGIUS, an eminent Dutch divine and commentator, was b. at Leuwarden in Friesland, May 16, 1659. He studied at Franeker and Leyden, at which latter place he was created D.D. in his 29th year. In 1681 he was appointed professor of oriental languages; and two years later, received the chair of theology in the university of Franeker, where he died, Mar. 21, 1722. Vitringa is regarded as one of the most learned and laborious divines of his age, and has left many excellent and erudite works, chiefly commentaries on portions of the Scriptures, nearly all of which are in Latin. Among others may be mentioned, *Commentarius in Jesaiam*; *Amicis Apocalypses Johannis Apostoli*; *Commentarius in Jeremiam*; *Commentarius in Zechariam*; *Vetus Synagoga*; *Dissertationes Sacre*; *Typus Theologicæ Prophetiæ*, etc.

VITRIOL (derived from the Latin *vitrum*, glass) is a term which the early chemists applied to glass-like salts, distinguishing them by their colors into blue vitriol, green vitriol, and white vitriol. *Blue vitriol* is still the popular name for sulphate of copper, which may be obtained on a large scale in various ways, but most simply by boiling copper in an iron pot with dilute sulphuric acid, by which means we obtain a salt having the formula, $\text{CuO} \cdot \text{SO}_3 + 5\text{Aq}$, and crystallizing in oblique prisms of a clear blue color, which are soluble in four parts of cold, and two of boiling water, and when moistened, redden litmus paper. In large doses, it acts as a powerful irritant poison, unless, as is frequently the case, it is rejected by vomiting. In small but repeated doses (as from half a grain, gradually increased to two grains, made into pills with conserve of roses), it acts as a tonic and astringent, and will often check the discharges in cases of chronic diarrhæa and dysentery, when other medicines have failed; and according to Neligan, it has been found serviceable in croup by checking excessive bronchial secretion. It has been much employed in cases of epilepsy, and is a valuable remedy in chorea and other spasmodic diseases, especially when they occur in weak constitutions about the period of puberty. Its use in doses of from 10 to 15 grains as an active emetic is mentioned in all works on materia medica; but sulphate of zinc in a dose of a scruple, is as efficacious, and safer. Externally, this salt in solution (varying from one to ten grains in an ounce of water) forms a good application to indolent ulcers, aphthæ, cancrum oris, and the sore throat in scarlatina; it is also used in chronic ophthalmia, and as an injection in cases of urethral or vaginal discharges. In the solid state, it is used as a caustic to repress excessive granulations (proud flesh), to destroy warts, and to excite indolent ulcers.

Green vitriol is the popular name for sulphate of iron. Its characters, the method of obtaining it, and its therapeutic uses, are sufficiently noticed in the article IRON.

White vitriol will be described in the article ZINC.

Oil of vitriol is the old name given to commercial sulphuric acid, in consequence of its oily appearance, and of its being formerly obtained from green vitriol.

Elixir of vitriol is the old name for the aromatic sulphuric acid of the pharmacopœia. It is a mixture of three ounces of sulphuric acid and two pints of rectified spirit, in which powdered cinnamon and ginger have been digested. Its uses in doses of from ten to thirty minims, in a wine-glassful of water, are much the same as those of dilute sulphuric acid, but it is more agreeable to the taste, and sits more lightly on the stomach.

VITRO DI TRINA, the name given to a beautiful kind of glass which was made by the Venetians in the 15th century. Its distinguishing character is a series of wave-like marks in opaque colors, but usually white, arranged pretty regularly in the substance of transparent glass.

VITRUVIAN SCROLL, a continuous scroll-work forming a kind of cresting used in classical architecture.

VITRUVIUS, the name of two Roman architects, the most celebrated of whom is MARCUS VITRUVIUS POLLIO, about whom we have no direct information further than the mention of his name by Pliny and Frontinus, though, from the references to himself in his own work, we can gather that in all probability he was born about 76 or 80 B.C. He received a liberal education, pursued specially those studies which were calculated to fit him for the profession of an engineer and architect, and was engaged in the African war (46 B.C.) as superintendent of military engines. He does not seem to have become very popular as an architect, and never succeeded in acquiring wealth, though the constant patronage which the emperor (Augustus) was induced by his sister (probably *Octavia Minor*) to extend to him, insured him comfortable subsistence during his

life. The only public work he executed was a basilica at Fanum. Vitruvius in his book, *De Architectura*, enters at some length into the reasons which induced him to write it, the chief of them being, the care bestowed by his patron (after settled peace had been secured to the empire) on buildings public and private, his intention to erect numerous edifices, and the danger that, owing to the depraved architectural taste of the time, the beauty and correctness of the pure Grecian models would be neglected. The *De Architectura* is arranged in ten books; the *first* of which contains a dedication to the emperor, a general view of architectural science, hints as to the proper subjects of study for young aspirants, and directions for building cities; the *second* treats of the early history of architecture, and of the materials employed at various times, and contains a sketch of the physical theories of various philosophers; the *third* and *fourth* treat of the erection of temples, and in connection with this, of the four orders of architecture, Ionic, Corinthian, Doric, and Tuscan; the *fifth* treats of public buildings; the *sixth*, of private houses in town or country; the *seventh*, of the finishing and decoration of private buildings; the *eighth* of water, the mode of discovering it, whence it may be obtained, and the modes of conveying it in large quantities to a distance; the *ninth*, of the principles of gnomonics, the rules for dialling, and other subjects physical and astronomical; and the *tenth*, of machines used in building and in military warfare, of the mechanical powers, of mills, engines for raising water, odometers, etc. To each book there is a preface, more or less connected with the main subject of the book, and it is in these prefatory remarks that we discover what we know of Vitruvius's personal history. There have been many editions of Vitruvius; the first was published along with Frontinus's *De Aqueductibus* at Rome about 1486, and afterward at Florence (1496) and Venice (1497). Rude woodcuts were introduced into various subsequent editions; and the edition of Bode (Berl., 1800) has a volume of plates; but the best edition, that of J. G. Schneider (Leip., 3 vols. 1807—1808), is without illustrations.—See Smith's *Classical Dictionary of Biography and Mythology*.

VITRY-LE-FRANÇOIS, a t. of France, in the dept. of Marne, on the right bank of the river Marne, 128 m. e. of Paris by railway. The first site of the town was at Vitry-en Perthois; but it was taken and burned by Charles V. in 1544. François I. rebuilt Vitry-le-François on its present site, surrounded with fosses and ramparts, and erected a castle for its protection. There are manufactures of hats and cotton goods. Pop. 76, 7,580.

VITTO'RIA, a modern t. of Sicily, in the province of Siracusa, 18 m. n.w. of Modica, on the Camarana. It possesses little interest, and is made only a noonday resting-place for travelers. The soil of its vicinity, however, is fertile in fruits and wines, bee-culture is carried on, and the town maintains an active trade in silk and cattle. Pop. 17,855.

VI TUS, ST., DANCE. See CHIOREA.

VIVANDIÈRE, in continental armies, and especially that of France, a female attendant in a regiment, who sells spirits and other comforts, ministers to the sick, marches with the corps, and contrives to be a universal favorite. Although a familiar friend to all, these women contrive to maintain themselves respectable, and generally respected; and a corps is usually extremely jealous of the slightest discourtesy shown to its vivandière. The woman wears the uniform of the regiment, short petticoats replacing the man's tunic.

VIVERRIDÆ, a family of *carnivora*, having the body elongated, the claws partly retractile, the pupil of the eye circular during the day, and not contracted into a vertical line as in the *felidæ*, and in general a strong musky odor, proceeding from a secretion in a pouch near the anus. To this family belong the civet, genet, ichneumon, etc.

VIVERRIDÆ (ante). A family of semi-plantigrade carnivorous animals, embracing the *viverra* of Linnæus, who placed it between *felis* and *mustela*. The civets (*viverra*) of Cuvier are placed in the last edition of his *Règne Animal* between the dogs and hyenas, which are followed by the cats (*felis*). The genera and species are numerous. They are all of moderate size, with sharp muzzles and long tails, and are more or less striped, banded, or spotted. The dental formula of the genus *viverra* is

$$i \frac{3-3}{2-3}; c \frac{1-1}{1-1}; pm \frac{4-4}{4-4}; m \frac{2-2}{2-2} = 40.$$

The upper fourth premolar and the lower first molar have cutting edges, while both the upper molars and the last lower molars have crowns faced with tubercles. The canines are long and sharp, and the tongue is very rough, with numerous hard, elongated papillæ; the claws are partially retractile, and on exposure to the light the pupils contract to a line. In most of their characters, therefore, the viverridæ are much more carnivorous than the mustelidæ, and have close affinities with the hyenas. Several species of the family have anal glands which secrete a peculiar odorous, fatty substance called *civet*. They all belong to the old world. An American genus, *bassarix*, was once referred to the family, but it is now known that the structure of its skull relates it to the rac-

coons. The true civet-cat is a native of n. Africa and eastern Asia. See CIVET, *ante*. Among the other forms referred to the viverride, are the *mongoose* (ichneumon, q.v.), the genet (q.v.), the *suricate* (q.v.), the *paradoxurus*, the *mongoose* or *crossarchus* of western Africa, and the *cryptoprocta* of Madagascar. The *paradoxurus* has much the character of the civets and genets. It has a tail capable of being rolled to its base, but it is not prehensile; toes five, nearly palmated; sole of foot tuberculous, applied throughout its surface to the ground. The *paradoxurus typus*, or *paradoxure*, was confounded by Buffon with the common genet (correction made by M. F. Cuvier). In form and habits it does not differ much from that animal, but the odoriferous pouch is absent. The tail is very peculiar. It is as long as the body, and depressed above and below. The extreme end when extended is turned over, bottom uppermost, and the animal can roll it up spirally from the extremity to the base. In the *crossarchus* the head is more rounded than in the ichneumons, and the muzzle is larger and movable. The pupil is round, and the tongue smooth on its edges, but rough and horny in the center. Pouch, secreting an unctuous, fetid, fatty matter. *Crossarchus obscurus* is nearly two feet long including the tail, which is about eight inches. The fur is composed of two kinds of hair, the external harsh, of a uniform brown, a little brighter on the head; cheeks pale. The genus *cryptoprocta* approaches more nearly than most of the other forms to the *felida*, having claws on both feet retractile, and furnished with the retractile ligaments. It has a slender body; strong limbs of moderate length; head narrow and slightly elongated; small glandular muzzle; nostrils with deep lateral sinus; numerous stiff whiskers; ears rather large and rounded, with a fold on the posterior margin and hairy within and without, except in the auditory passage; fore rather shorter than hind limbs; tail as long as body, reaching, when turned over, to the ears; soles on fore feet naked to carpus, on the posterior, to the heel; toes united nearly to the tips. *C. ferox* is a native of Madagascar.

VIVES, JUAN LUIS, LL.D., 1492-1540; b. Valencia, Spain; studied at Paris and Louvain; professor of the Latin language at Louvain; published a book at Paris in 1519 against the schoolmen; formed an intimate friendship at Louvain with Erasmus and Budaus; invited to England by Henry VIII., who made him tutor of the princess Mary, 1523; wrote for her two essays entitled *De Ratione Studii Puerilis Epistola Duæ*; imprisoned by order of Henry VIII. for opposing the divorce of queen Catharine of Aragon, 1528; when released went to Bruges. He wrote on philology, philosophy, and divinity. His principal works are *De Causis Corruptarum Artium*; *De Initiiis Sectis et Laudibus Philosophorum*; *De Veritate Fidei Christianæ*; *De Anima et Vita*; commentaries on Augustine's *City of God*, the *Dream of Scipio*, the *Bucolics of Virgil*.

VIVIPAROUS FISH. It has been mentioned in the articles FISHES and REPRODUCTION that a few species of fishes are viviparous, or rather ovoviviparous, the eggs being hatched within the ovary. An example of this occurs in the viviparous blenny of the British coasts. See BLENNY. But it is the common characteristic of a whole family of the order *pharyngognathi*, therefore designated by the popular name of viviparous fish, and by the scientific name of *embiotocida*—a name formed from the Greek, and signifying *viviparous*. The general aspect of fishes of this family is somewhat perch-like; the scales are cycloid, the gill-covers are entire, the lips are thick. On the n.w. coast of America from San Francisco to Sitka, species of this family are very abundant. They come into shallow water near the coasts, when the time approaches for producing their young, which is about the middle of summer. They swim in vast shoals close to the surface, and have a peculiar habit of leaping high out of the water when alarmed, of which the Indians take advantage to capture them, by striking the water violently with their paddles, and uttering yells. The terrified fish leaping out of the water, many of them fall into the canoes. The Indians also capture these fishes by thrusting a spear with four barbed points into the midst of a dense shoal. They can be easily taken by nets, but are not of great value for the table.

VIVISECTION—a term which is employed to designate operations performed with the knife on living animals, with the view (1) of increasing our physiological knowledge; (2) of confirming previously known facts; and (3) of giving dexterity in operative surgery—is a course of procedure which may be traced back to almost the earliest periods of medicine and surgery, and was largely practiced in the Alexandrian school. It is, however, only comparatively lately—about half a century ago, when the barbarous experiments of Magendie, Brachet, and other distinguished French physiologists, became known in this country—that the subject has attracted much popular notice; and during the last ten years, attention has been so specially drawn to the atrocities systematically carried on in the great French veterinary colleges at Alfort and Lyons, that a deputation of "the royal society for the prevention of cruelty to animals" laid a statement of the facts before the emperor Napoleon. When it is stated that, with the nominal object of teaching the veterinary students at Alfort to become skillful operators, six living horses were supplied to them twice a week—that sixty-four operations were performed on each horse, and that four or five horses generally died before half the operations were completed—that it takes nearly two days to go through the list—and that all the old exploded operations, as well as those now practiced, were performed—and lastly, when

it is borne in mind that most, if not all, these operations could just as instructively have been practiced on the dead animal (as is done in this country), there cannot be a doubt that a vast amount of unwarrantable and gratuitous cruelty was carried on in these establishments. Although the subject was brought before the *académie des sciences*, and warmly discussed, the final conclusion was "that the complaints of the London society are totally without foundation; and that there is no occasion to take any notice of them." We believe that it is only by the veterinary colleges of France that the view is advocated that vivisection is necessary for the purpose of giving dexterity in surgical operations.* But while all right-minded persons—except the majority of the members of the French academy, whose votes were probably influenced by a feeling of nationality—must concur in the view, that the argument in favor of vivisection utterly breaks down, some go further, and doubt whether any experiments on living animals, performed with the object of advancing medical and surgical knowledge, and of thereby relieving, indirectly, human suffering, or prolonging human life, are, on moral grounds, to be regarded as justifiable. In opposition to this view, it is maintained that, under certain circumstances, and with due restrictions, such experiments are not only justifiable, but their performance becomes a positive duty. It may be observed that, though in stating this controversy the term vivisection is retained, the remarks apply to all kinds of experiments on living animals. It is universally admitted that man may destroy animals for his food, and to furnish him with many of the necessities and luxuries of life; and most persons go a step further, and see no impropriety in the pursuit of field-sports. Now, as Dr. Markham argues in his excellent prize essay on this subject, in all these cases of admittedly legitimate destruction of animal life, the infliction of pain is a necessary ingredient. In some modes of destruction, the death-blow is dealt at once, and the pain is but fleeting; while in others the agony of the death struggle is equivalent to a prolonged and painful torture. An ox may be at once stunned, while the animal bled to death suffers prolonged convulsive struggles. The humanitarian, if he be a sportsman, thinks little of the lingering pain which a wounded bird or broken-legged hare undergoes; nor, if he be engaged in the whale-fishery, does he lament over the prolonged suffering which the object of his pursuit must suffer before its capture. If, then, man can legitimately put animals to a painful death in order to supply himself with food and luxuries, why may he not also legitimately put animals to pain, and even to death, for the far higher and more noble object of relieving the sufferings of humanity, and of prolonging human life? To point out what gain has accrued to physiology (and hence, indirectly, to the healing art) by experiments on living animals, would occupy many pages of this work. It is sufficient to allude to the facts, that the doctrine of the circulation of the blood, and of the existence of, and circulation through, the lacteals, was thus established, and that nearly the whole of our present knowledge of the functions of the nervous system has been thus obtained, and could never have been afforded by the most minute anatomical research, and that in consequence of the knowledge thus obtained we no longer divide a motor nerve, and thus paralyze the face, in the hope of relieving the *douloureux*; while on the other hand, thanks to the researches of Brown-Sequard, Bernard, and others, we can now see our way to a more rational mode of treating epilepsy, various obscure forms of paralysis, etc. Without vivisection, we could never clearly have understood the causes of the sounds of the heart, without the knowledge of which the stethoscope would have been useless in the diagnosis of cardiac diseases; nor should we have known anything of the true nature of that mysterious disease, diabetes. The Hunterian treatment of aneurism by ligature, which has saved hundreds of human lives, was worked out by experiments on living animals. The study of anæsthetics, which, after prolonged investigation, led to the introduction of chloroform (soon, possibly, to be superseded by some even less dangerous agent), was unquestionably accompanied by the suffocation of many animals; but surely no one who can form any estimate of the vast amount of misery which has been spared to humanity by the general introduction of the use of chloroform into surgical and midwifery practice, can regret the sacrifice. Indeed, the advantage of the discovery is experienced in more ways than one upon the lower animals, since the domestic animals are subjected to its beneficent influence when surgical operations are necessary, and since, in most cases, animals subjected to physiological experiments are now usually rendered insensible by it. If such questions as—the best means of restoring to life persons apparently drowned—why chloroform sometimes kills, and how those who are suffering under apparently fatal effects can be best recovered—admit, as they doubtless must, of a solution, that solution must be sought for in experiments on living animals. These and a multitude of similar considerations which might be adduced, are sufficient, it is maintained, to lead any unbiased inquirer to the conclusion that experiments on living animals, performed with the object of advancing medical, surgical, or toxicological knowledge, and of thereby indirectly relieving human suffering, or of prolonging human life, are not only justifiable, but a matter of duty.

At the meeting of the British association held at Liverpool in 1870, the general committee requested the committee of section D (Biology) to draw up a statement of their

* *Vivisection; is it necessary or justifiable?* Being two prize essays, published by the royal society for the prevention of cruelty to animals (Lond. 1866).

views on physiological experiments in their various bearings, and they further requested the committee to consider "from time to time whether any steps can be taken by them, or by the association, which will tend to reduce to its minimum the suffering entailed by legitimate physiological inquiries." Accordingly, at the meeting of the association at Edinburgh in 1871, the biological committee gave in a report, in which the following resolutions were presented: 1. That no experiment which can be performed under the influence of an anæsthetic ought to be done without it; 2. That no painful experiment is justified for the mere purpose of illustrating a law or fact already demonstrated; 3. Whenever, for the investigation of new truth, it is necessary to make a painful experiment, every effort should be made to insure success, so that the suffering inflicted may not be wasted—that, therefore, no painful experiment ought to be performed by an unskilled person, or in an unsuitable place; 4. In the scientific preparation for veterinary practice, operations ought not to be performed on living animals for the purpose of obtaining manual dexterity. On the reception of this report, a standing committee was appointed for the purpose of carrying out, with all the influence of the British association, the above humane suggestions.

A still more satisfactory result, however, was the interference (following upon the report of a royal commission) of parliament, which, in the year 1876, gave its assent to a bill to amend the law relating to cruelty to animals, the purpose of which was the restriction, or better regulation, of vivisection. The provisions of this act coincide to a great extent with the resolutions of the committee as given above, and require that every one performing a painful experiment upon a living animal (which must be with a view of advancing physiological knowledge, or knowledge which will be useful for saving or prolonging life, or alleviating suffering), must hold a license from one of her majesty's principal secretaries of state. Persons holding a conditional license are allowed to perform such experiments only in a registered place, while the same rule applies to experiments performed for the sake of instruction (which, however, are permitted only under certain stringent limitations). Special protection is afforded to horses, asses, mules, dogs, and cats. The act does not apply to invertebrate animals.

VIZAGAPATAM, a district of British India, presidency of Madras, one of the provinces called northern Circars, on the w. side of the bay of Bengal; 7,650 sq. miles. Pop. 1,254,272. A lofty rocky ridge runs parallel to the sea-shore, and frequently within a short distance of it, through nearly its whole extent. West of this is another chain, the eastern Ghauts; and between them a narrow, well-cultivated valley. The climate from March to June is hot, but the heat is moderated by the sea-breeze during the day. The soil in some parts is fertile, producing rice, maize, sugar-cane, indigo, cotton, and tobacco. Fruits and garden vegetables are scarce. The forests on the western hills abound in large teak trees. Manufactures are numerous. This district was in possession of the French 1753-59, when it was taken by Clive, and annexed to the territories of the East India company.

VIZAGAPATAM, a t. of British India, capital of the district of Vizagapatam, at the mouth of the river of the same name, on the w. shore of the bay of Bengal; pop., 40,000. It is near a promontory called *Dolphin's Nose*, a mountain 1500 ft. high. It has a good harbor and a large trade. It is a military station, but being unhealthy, Europeans have retired to Waltier, 3½ m. distant. A Hindu temple of great fame and antiquity is at Semachittam near Vizagapatam.

VIZIER, or **VIZIR** (pronounced *vîz-er*'), the title of various high functionaries in the Ottoman empire, and other Mohammedan states. The word, which is of Arabic origin, and signifies "he who bears or supports (a burden)," was first bestowed as a title of honor on the chief-minister of the first Abbaside calif, in 750 A.D. During the decline of this dynasty, the vizier had to "bear the burden" of government almost entirely, and consequently, increased so much in power and authority, that the califs thought it prudent to counteract his influence by the creation of the new dignity of *Emîr-ul-Omrah* (q.v.), which, being generally bestowed upon one or other of the powerful alien princes who had made for themselves sovereignties in Persia, was found to be an efficacious counterpoise. The dignity of vizier was first introduced among the Ottoman Turks during the reign of their second sultan, Orkhan, and the title was exclusively confined to the sultan's prime-minister; but in 1386, it was conferred by Anurath I. on his victorious general, Timur-tâsh, and the prime-minister's title was then changed into *vîzir-az-hem*, "grand or illustrious vizier." From this period, the number of viziers was gradually increased, but from the commencement of the 18th c., only seven of them were ministers. The title is now given, as is also that of *mujiir*, to all the Turkish ministers of state. The grand vizier is, after the sultan, the most important personage of the Turkish empire; he unites in his own person the whole powers of the state, and is charged with a corresponding responsibility. The political changes introduced at the end of 1876 (by which Turkey became a "constitutional" monarchy) have not seriously affected the dignity of vizier, though in 1878 the title was abolished, that of president of the council of ministers being substituted. In a few months, however, the vizierate was restored, subject as formerly to more serious control from the intrigues of the palace

than from the new parliamentary constitution. The ministers, who are nominally responsible to the parliament, are directly dependent on the grand vizier.

VIZZINI, a t. of Sicily, in the province of Catania, stands on a hill. It is well built, and besides containing a college and hospital, there are a number of handsome buildings and churches, containing many fine pictures. Fruits in abundance are produced, and agates are found. Pop., 13,400.

VLAARDINGEN, an unwalled t. in south Holland, lies about five m. w. from Rotterdam, at a short distance from the New Maas. It has a good haven, and sends annually a large fleet of vessels to the herring-fishing, besides carrying on a considerable shipping-trade with the Mediterranean, Norway, North America, Portugal, and Spain. The pop., Jan. 1., 1875, was 9,049. Besides the herring and cod fishing and shipping-trade, the industries are: ship-building, rope-spinning, distilling gin, sawing wood, grinding corn, boiling oil, tar, &c. Vlaardingen is one of the oldest towns in south Holland, the church now called the reformed church having been consecrated by Willebrord in the 7th c., but nearly rebuilt in 1744. It was the birthplace of the poets Arnold Hoogvliet (1687-1763) and Jacob van Dijk (1745-1828).

VLADIMIR, a government of Russia, bounded on the e. by the government of Nijni-Novgorod, and on the s.w. by that of Moscow. Area, 18,796 sq.m.; pop., '70, 1,259,923. The surface is level or undulating; the soil consists chiefly of clay or sand, and is fertile only in exceptional spots. The principal rivers are the Oka and its tributaries, of which the chief is the Kliasma, a navigable stream. Of the lakes, which are numerous, but of inconsiderable size, that of Pereiaskav is remarkable for its productive fisheries, and is famous in history as being the cradle of the Russian fleet. After St. Petersburg and Moscow, the government of Vladimir is the most actively industrious in the Russian empire. Of its manufactured goods, cotton-yarn and cloth are made to the value of 13,000,000 roubles annually; chintz and dyed goods, 12,000,000 roubles; linen, 2,000,000 roubles; glass, 1,000,000; iron and brass foundries produce goods to the value of 1,000,000 roubles; and the manufactures of chemicals and paper are very extensive. The inhabitants are also much employed in painting images and in knitting stockings, which are used in Russia and Siberia, and yield 1,000,000 roubles per annum. The grain-crops raised are insufficient for local consumption, and corn is imported from neighboring governments. Hemp is successfully grown; and besides being used in considerable quantities in local manufactures, is exported to Archangel and St. Petersburg. Forests, mostly of pine, form a border round the government, but do not occur in the interior. In the 9th c., the country was inhabited by Finns; and though it was subsequently conquered and settled by the Slavonians, traces of the original inhabitants are visible in the present population.

VLADIMIR, a t. of great Russia, capital of the government of the same name, stands on the left bank of the Kliasma which is high and wooded, 125 m. n.e. of Moscow. It was founded in the 12th c., during the ascendancy of the Dukes of Vladimir, and was the capital of Russia till 1828. It contains many historical remains, as the Kremlin; the "Golden Gate," built in 1158; ruins of old fortifications, and many ancient churches. The ecclesiastical seminary is important. There are several manufactures, and a trade in corn. Cherries are a considerable local product. Pop., '67, 15,478.

VLADIMIR, the name of two celebrated Russian princes, the former of whom, VLADIMIR SVIATOSLAVITCH, was the first Christian sovereign of Russia. On the death of his father (972), Vladimir, though illegitimate, received Novgorod as his share of the heritage, but was driven out by Jaropolk, who had already murdered the third brother, Oleg. However, Vladimir, by the aid of a body of Varangians (from Scandinavia), returned and overcame Jaropolk, by whose assassination (980) he became sole ruler in Russia. Disembarrassing himself of his dangerous allies by persuading them to take service with the Byzantine emperor, he next recovered by force from the Poles the provinces of which they had deprived his brother, and subdued various tribes which had recently revolted. Russia at this time was an ill-compacted empire; the various Slavic tribes which dwelt within its boundaries acknowledged the sovereignty of the Russian princes solely by the payment of tribute, and that only when the princes were powerful enough to enforce it; hence it was the custom for the princes personally, or their delegates, to go their regular rounds after the fashion of tax-collectors, backed up by a large armed retinue. Vladimir tried to increase the central authority, and one of the means he adopted was the erection at his capital, Kiev, of the idol Perun (Thunder), the supreme divinity of the Slaves, and of the images of other inferior deities, Slave and Finnish. But a few years more effected a remarkable change; many of Vladimir's subjects were Greek Christians; his mother, Olga, had become one; besides, he wished to be allied with the Byzantine imperial family, and moved by these and other reasons of personal or patriotic ambition, he resolved to turn Greek Christian. His mode of arriving at conversion and matrimony was as curious as effective; he first made an attack upon the Byzantine empire, then sent an embassy to Constantinople, promising peace and his conversion, in exchange for the hand of Anna, the sister of Constantine IX., threatening war in case of refusal. His demands were gladly complied with; and after

his marriage and baptism at Kherson in 988, he returned to Kiev, destroyed all the idols, and commanded his subjects to be baptized. They had not the slightest objection to be baptized, if their feared and admired prince wished it; and for days the Dnieper was crowded with applicants for the first testing ordinance of Christianity. It could hardly have been expected that a conversion managed in such a fashion would have affected the manners and conduct of such an arbitrary, violent, and daring prince as Vladimir; yet, strange to say, from 988 he appeared to have undergone a thorough mental and moral transformation; churches were built, schools established, capital punishment was supplanted by a fine, and such excessive lenity shown to all criminals, that in the interests of good government, it was found necessary to remonstrate with the thorough-going convert. Formerly, the wisdom and valor for which he was renowned were equaled by his licentiousness, so that the chronicles had more than one reason for saying that "he was like unto Solomon;" but the strictest chastity characterized the latter part of his life; and his charity to the poor, and personal forbearance, were extreme. He died in 1014, three years after his wife Anna. The Russian church has decreed him the epithets of "saint," and "equal of the apostles."—VLADIMIR II. VSEVOLODOVITCH, surnamed *Monomachus*, grand-prince of Kiev, the great grandson of the preceding, was born in 1053. His father being a younger son, there seemed to be little chance of Vladimir's attaining power in the ordinary course of events, in his own country; and he accordingly led a band of auxiliaries to join Boleslas II. of Poland in his wars with Bohemia; gaining such renown, as on his return ranked him at the head of Russian warriors. Vladimir's father having, as the eldest of the Russian princes, succeeded to the grand principality of Kiev (1078), Vladimir took advantage of the opportunity to wrest from their lawful possessors, Smolensk, Tchernigov, and Novgorod; though some years afterward his cousin Oleg, the dispossessed prince of Tchernigov, with the aid of the Polotzee or Cumans (a Turkish nation which was at that time the terror of the Russians), recovered his dominion. Vladimir having subsequently routed the Polotzee in several engagements, became so extremely popular that in 1112 he was chosen grand-prince of Kiev, and for 13 years he displayed his eminent qualities as a ruler and a warrior. The maintenance of internal tranquillity, the improvement of old, and the building of new towns, and the encouragement of commerce, on the one hand; and the successful campaigns against the Tchudes, Poles, Polotzee, and Bolgars (a Mohammedan commercial people settled on the Volga), on the other, are the principal characteristics of his reign. Most of Vladimir's fame, however, rests on his writings, which present an interesting picture of the internal life of Russia in the 11th c., and indicate prominently the earnest practical influence of the newly introduced Christianity. Vladimir's mother was a daughter of Constantine Monomachus; and Alexis Comnenus, who wished to be on good terms with his powerful northern neighbor, is said to have sent him the crown, scepter, and sword of his grandfather, which are still shown as such, and which are employed in the coronation of the czar.

VLADISLAS, or ULADISLAS. See LADISLAS, *ante*.

VODENA, a beautifully-situated t. of Turkey, in the province of Saloniki, on a mountain slope, 46 m. w.n.w. of Saloniki. Water is here very abundant; torrents rush headlong down the middle of all the streets, and the sound of cascades is everywhere heard. The houses, from the archbishop's palace to the humblest cottage, are picturesque, but are not otherwise remarkable. The streets are wretchedly paved. Vodena occupies the site of the ancient Edessa, the early capital of Macedonia. Pop. estimated at 12,000.

VOGEL, EDOUARD, 1829-56; b. Crefeld; son of Johann Karl; educated at Leipsic, studied astronomy at Berlin with Encke, and was employed to assist Hind in Bishop's observatory, Regent's park, London. In 1853 he volunteered to go to central Africa to assist in the explorations of Overweg, Barth, and Richardson; visiting lake Tchad, Kuka, Yakova (publishing some account of his discoveries in German periodicals), and penetrated into the kingdom of Waday, where, in the town of Wara, in 1856, he was killed by order of the sultan. Previous search for him having proved unsuccessful, an expedition went out, in 1860, in charge of Von Heuglin. His sister, Elise Polko, published *Erinnerungen an einen Verschollenen* (1863), containing his notes.

VOGHERA, a city of northern Italy, in the province of Pavia, stands on a fertile elevated plain, in a district rich in vineyards, orchards, and corn-fields, 24 m. e.n.e. of Alessandria by railway. The *Via Emilia* passes through the town and divides it into two parts. There are several handsome squares, of which that of the Duomo is the chief; the streets are adorned with porticoes; and there is an old castle, built by Galeazzo Visconti in 1372. The civic palace contains many valuable parchments and manuscripts of the 11th, 12th, and 13th centuries. Silks, linens, canvas, and leather are manufactured. Pop. 11,450.

VOGT, KARL, b. Giessen, Hesse-Darmstadt, and there studied chemistry under Liebig. In 1835 he removed to Bern, studied medicine, and, after taking a degree, devoted much time to geology and zoology under Agassiz, becoming professor of natu-

ral history at Giessen in 1847. This chair he lost on account of his share in the political movements of 1848. He went to Switzerland, and in 1852 became professor of geology at Geneva, and in 1853 at Bern, where he still remains. His course of lectures *On Man: his place in Creation and in the History of the Earth*, have been translated into English, and he has published other works of high reputation.

VOICE (Lat. *vox*) may be defined as an audible sound produced by the larynx, and may be produced by any animal possessing that organ; while speech or articulate language may be regarded as voice modified in the cavity of the mouth. The larynx (q.v.) is the organ by which the so-called *vocal sounds* (or primary elements of speech) are produced. In the article LARYNX, it is shown that there are two groups of muscles, which respectively govern (1) *the pitch of the notes*, and (2) *the aperture of the larynx*. Those which affect the pitch of the notes are divisible into two antagonistic sub-groups, viz., (a) those which depress the front of the thyroid cartilage on the cricoid, and *stretch* the vocal ligaments; and (b) those which elevate the front of the thyroid cartilage, and *relax* the vocal ligaments; while those which control the aperture of the glottis are divisible into (c) those which *open* it, and (d) those which *close* it. It is only the first of these groups, viz., the muscles which stretch or relax the vocal ligaments, that is concerned in the production of voice. In the ordinary condition of rest there is a wide opening between the vocal ligaments, which are in a state of complete relaxation, and the air passes freely between them. For our knowledge of the appearances presented under varying conditions by the interior of the larynx, we are mainly indebted to prof. Czermak, the inventor of the laryngoscope (q.v.); and the reader who wishes to enter fully into this subject is referred to his work on that instrument, of which a translation was published by the New Sydenham society in 1861. The movements of the arytenoid cartilages during the production of vocal sounds can be distinctly seen—the views that had been previously deduced, from theory and experiments on the dead subject, being thus confirmed by ocular proof. As soon as we wish to utter a sound, the two arytenoid cartilages raise themselves in the fold of mucous membrane which covers them, and approach one another with surprising mobility. This movement effects the approximation of the vocal cords, and consequently the contraction of the glottis. It is impossible to study with the laryngoscope the mode of formation of the gravest chest-sounds, because the arytenoid cartilages become so raised that they almost come in contact with one another, while they bend under the border of the depressed epiglottis, and thus conceal the interior of the larynx. During the emission of the most acute sounds, the glottis contracts into a mere line, on each side of which the vocal cords may be recognized by their whitish-yellow color; while further outward, and separated from the former by a narrow groove, are the false or superior vocal cords of either side. The arytenoid cartilages are raised, and come in contact in the median line, the epiglottis is drawn outward, and a short stiff tube is then formed above the glottis; all these parts being, as we learn from our sensations during the experiment, in a state of very great tension. Independently, however, of such observations as those we have recorded from Czermak's interesting memoir, any one may easily prove for himself that the aperture of the glottis is much contracted during the production of sounds by comparing the time occupied by an ordinary expiration with that required for the passage of the same quantity of air during the maintenance of a vocal sound; moreover, the size of the aperture varies with the note that is being produced, as may be readily seen by any one who compares the time during which he can hold out a low and high note. When the distance between the vocal cords exceeds one-tenth of an inch, no sound can be produced.

How the vocal cords produce sounds is a question which has long attracted the attention of physiologists and physicists. To answer it they were compared with various musical instruments. More than a century ago Ferrein (*De la Formation de la Voix de l'Homme*, 1741) compared them to vibrating *strings*; and, at first sight, there is an apparent analogy; but on further investigation (for reasons which may be found in Carpenter's *Human Physiology*, 6th ed. p. 715), this view was found to be untenable. The analogies between the organ of voice and the *flute-pipe*, in which the sound is produced by the vibration of an elastic column of air contained in a tube, were then investigated, but found to fail. The third class of instruments with which the human organ of voice has been compared are vibratory *reeds* or *tongues*, which may either possess elasticity in themselves, or be made elastic by tension. From the experiments of Weber it appears that the action of the larynx has more analogy to that of *reed-instruments* than to the instruments previously named, and though there would seem at first sight to be a marked difference between the vocal ligaments and the membranous tongue of any reed-instrument, this difference is not very great. Müller ascertained that membranous tongues made elastic by tension may have three different forms, of which the following, which alone concerns us, is one: "Two elastic membranes may be extended across the mouth of a short tube, each covering a portion of the opening, and having a chink left open between them." Here there is clearly an approximation to the human glottis, which may be increased by prolonging the membranes in a direction parallel to that of the current of air, so that not merely their edges but their whole planes shall be thrown into vibration. Prof. Willis has, upon this principle, invented an *artificial glottis*, in

which the vocal ligaments are imitated by leather, or preferably by sheet india-rubber. It is composed of a wooden pipe of the form of fig. 1, *a*, having a foot, *C*, like that of an organ-pipe, and an upper opening, long and narrow, as at *B*, with a point, *A*, rising at one end of it. A piece of leather or sheet india-rubber doubled round this point, and secured by being bound at *D* with strong thread, will form an artificial glottis, *b*, while its upper edges, *G*, *H*, are capable of vibrating or not by inclining the planes of the edges. Two pieces of cork, *E* and *F*, are glued to the corners to make them more manageable. From this machine various notes may be obtained by stretching the edges of the leather in the directions of their length, *G*, *H*; the scale of notes yielded by leather is much more limited than that yielded by india-rubber; and other observers have found that the middle coat of the arteries in a moist state (as being more elastic, and almost identical in structure with the vocal ligaments), yields more satisfactory results even than india-rubber. "It is worthy of remark," as

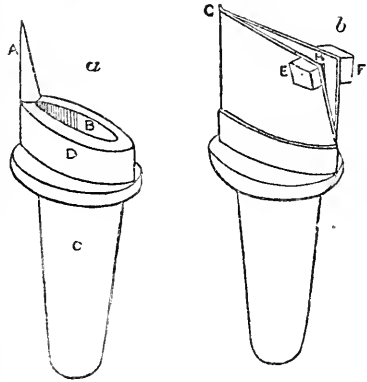


FIG. 1.

Dr. Carpenter observes, "that in all such experiments it is found that the two membranes may be thrown into vibration, when inclined *toward* each other in various degrees, or even when they are in parallel planes, and their edges only approximate; but that the least inclination *from* each other (which is the position the vocal ligaments have during the ordinary state of the glottis) completely prevents any sonorous vibrations from being produced."—*Op. cit.*, p. 718. The *pitch* of the notes produced by membranous tongues may be affected in various ways (as by increasing the strength of the blast, the addition of a pipe, etc), and is mainly governed by their degree of tension, while the foregoing statements show that the sound of the voice is the result of the vibrations of the vocal ligaments which take place according to the same laws with those of elastic tongues generally. Little is, however, known with certainty regarding the mode and degree in which the tones are modified by the shape of the air-passages generally, the force of the blast of air, and other circumstances.

The *falsseto* is a peculiar modification of voice, differing from the ordinary or *chest voice*, not only in the higher pitch of the notes, but also in their quality. The theory of its production is still an open point, into which we have not space to enter further than to remark that, according to prof. Wheatstone, falsseto notes are to be explained by supposing that "the column of air in the trachea may divide itself into *harmonic lengths*, and may produce a *reciprocation* of the tone given by the vocal ligaments."

The pressure of the air within the trachea during the production of voice is very considerable. From observations made by Cagniard-Latour on a man with a fistulous opening in the trachea, it was found that, when the patient called out at the top of his voice, the pressure was equal to that of a column of water 38 in. in height; when he spoke at his usual pitch, to one of 5 in.; and, when he sang in a high note, to one of about 8 inches. The glottis has been well chosen by Dr. Carpenter to illustrate the minute precision with which the degree of muscular contraction can be adapted to the desired effect. The musical pitch of the tones produced by it is, as we have shown, regulated by the degree of tension of the elastic vocal ligaments. Their average length, in a state of repose, is $\frac{3}{100}$ of an inch; while in the state of greatest tension it is about $\frac{3.8}{100}$ —the difference being thus *one-fifth* of an inch; while in the female the respective lengths are $\frac{5.1}{100}$ and $\frac{4.2}{100}$ respectively—the difference being thus about *one-eighth* of an inch. Now the natural compass of the voice, in persons who have cultivated the vocal organ, is about two octaves, or 24 semitones. Within each semitone an ordinary singer could produce at least 10 distinct intervals (the celebrated Mme. Mara could sound 100 different intervals between each tone, the compass of her voice being 21 tones), so that 240 is a very moderate estimate of the number of different states of tension of the vocal cords, every one of which can be produced at will; and the *whole* variation in the length of the cord being not more than one-fifth of an inch, even in man, the variation required to pass from one interval to another will not be more than $\frac{1}{12000}$ of an inch (while in such a case as that of Mme. Mara the distance would be reduced to $\frac{1}{17,000}$ of an inch).

In the production of vocal sounds, the delicate adjustment of the muscles of the larynx, which is requisite to the evolution of determinate tones, is directed by the sense of hearing, being originally learned under the guidance of the sounds actually produced; but "being subsequently effected voluntarily, in accordance with the mental conception of the tone to be uttered, which conception cannot be formed unless the sense of hearing has previously brought similar tones to the mind. Hence it is that persons who are born *deaf* are also *dumb*. They may have no malformation of the organs of speech, but they are incapable of uttering distinct vocal sounds, or musical tones, because they have not the guiding conception, or recalled sensation, of the nature

of these. By long training, however, and by imitative efforts directed by muscular sensations in the larynx itself, some persons thus circumstanced have acquired the power of speech; but the want of a sufficiently definite control over the vocal muscles is always very evident in their use of the organ."—*Op. cit.*, p. 556. A fund of interesting matter in connection with this subject may be found in Dr. Kitto's *Lost Senses*. Although not born deaf, he became *completely* so in early childhood, in consequence of an accident. His voice became similar to that of a person born deaf and dumb, and taught to speak. It was observed that the words which he had been accustomed to use before his accident, were still pronounced as they had been in childhood, the muscular movements concerned in their production having been still guided by the original auditory conception, while all the words subsequently learned were pronounced according to the spelling.

The various muscular actions which are concerned in the production of vocal tones, are commonly regarded as being under the influence of the will. It is, however, easy to show that this is not the case. We cannot, by simply *willing* to do so, raise or depress the larynx, or move one cartilage of it toward or from another, or extend or relax the vocal ligaments; although "we can readily do any or all of these things by an act of the will, exerted for a specific purpose. We conceive of a tone *to be* produced, and we *will* to produce it; a certain combination of the muscular actions of the larynx then takes place, in most exact accordance with one another, and the predetermined tone is the result. This anticipated or conceived sensation is the guide to the muscular movements, when as yet the utterance of the voice has not taken place; but while we are in the act of speaking or singing, the contractile actions are regulated by the present sensations, derived from the sounds as they are produced." From these remarks, in which Dr. Carpenter has placed a very difficult subject in as clear a light as the subject admits of, it follows that the muscular actions which are concerned in the production and regulation of the voice, are due to an *automatic* impulse, similar to what occurs in the movements of the eyeball, and in many other cases that might be adduced. There cannot be a doubt that the simple utterance of sounds is in itself an instinctive action; although the combination of these sounds into music or into articulate language, is a matter of acquirement.

Having explained the way in which the larynx produces those *tones* of which the voice fundamentally consists, and the sequence of which becomes *music*, we come to the subject of *speech*, which consists, in the modification of the laryngeal tones by other organs superior and anterior to the larynx (as the tongue, the cavity of the fauces, the lips, teeth, and palate, with its velum and the uvula acting as a valve between the throat and nostrils), so as to produce those *articulate sounds* of which language is formed. The organ of voice is thus capable of forming a large number of simple sounds, which may be combined into groups, forming words. Vocal sounds are divided into vowels and consonants. When a vowel is pronounced what happens? This question is thus answered by prof. Max Müller: "Breath is emitted from the lungs, and some kind of tube is formed by the mouth, through which, as through a clarionet, the breath has to pass before it reaches the outer air. If, while the breath passes through the vocal cords, these elastic *laminae* are made to vibrate periodically, the number of their vibrations determines the *pitch* of our voice, but it has nothing to do with its *timbre*, or vowel. What we call vowels are neither more nor less than the qualities, or colors, or *timbres* of our voice, and these are determined by the form of the vibrations, which form, again, is determined by the form of the buccal tube."—*Lectures on the Science of Language*, 2d series, p. 116. This writer enters very fully into the various configurations of the mouth requisite for the formation of the different vowels. (1.) In pronouncing *u* (the vowels are all understood to be pronounced as in Italian), we round the lips, and draw down the tongue, so that the cavity of the mouth assumes the shape of a bottle without a neck. (2.) If the lips are opened somewhat wider, and the tongue be somewhat raised, we hear the *o*. (3.) If the lips are less rounded, and the tongue somewhat depressed, we hear the *a* of the northern languages (as in *august*). (4.) If the lips are wide open, and the tongue in its natural flat position, we hear *a*. (5.) If the lips are fairly open, and the back of the tongue raised toward the palate, the larynx being raised at the same time, we hear the sound *e*. (6.) If we raise the tongue higher still, and narrow the lips, we hear *i*. The buccal tube here represents a bottle with a very narrow neck, of no more than six centimeters (or about 2½ in.) from palate to lips. Diphthongs arise when, instead of pronouncing one vowel directly after another with two efforts of the voice, we produce a sound *during* the change from one position to the other, that would be required for each vowel. Though the tube of the mouth thus modified by the tongue and lips is the chief agent in the production of vowels, Czermak has proved that the *velum palati* is changed in position with each vowel, and that it is lowest for *a*, and rises successively with *e*, *o*, *u*, and *i*, when it reaches its highest point. He likewise found that the cavity of the nose is more or less opened during the pronunciation of certain vowels. Languages might have been formed entirely of vowels, but the existing words, consisting solely of vowels, show how unpleasant such languages would have been. Something else was obviously wanted to supply what Max Müller happily terms *the bones of language*—namely, the consonants. These are commonly divided into (1) those which require a total stoppage of the breath at the moment previous to their being produced,

and which cannot, therefore, be prolonged; and (2) and those in pronouncing which the interruption is partial, and which, like the vowel sounds, can be prolonged at pleasure. The former are termed *explosive*, and the latter *continuous*, consonants. In pronouncing the *explosive* consonants, the posterior openings of the nostrils are completely closed, so as to prevent the passage of air through the nose, and the current may be checked in the mouth in three ways:—viz. (a) by the approximation of the lips; (b) by the approximation of the point of the tongue to the front of the palate; and (c) by the approximation of the middle of the tongue to the arch of the palate. The letters *b* and *p* are pronounced by the first of these modes; *d* and *t* by the second; and *g* (hard) and *k*, sounded as *key*, by the third; the difference between *b*, *d* and *g*, on the one hand, and *p*, *t* and *k*, depends upon the approximating surfaces being larger, and the breath being sent through them more strongly at the moment of opening in the former than in the latter group. The *continuous* consonants may be subdivided into three classes, according to the degree of freedom with which the air is allowed to escape, and the compression which it consequently experiences. In the *first* class no air passes through the nose, and the parts of the mouth that produce the sound are closely approximated, so that the compression is considerable. This is the case with *v* and *f*, *z* and *s*, *d* and *t*, *th*, *sh*, etc., the movement of the tongue being also concerned in the production of several of these sounds. In the *second* class, including *m*, *n*, *l*, *r*, the nostrils are not closed, and, consequently, the air is scarcely at all compressed. In pronouncing *m* and *n*, the breath passes through the nose alone; *m* is a labial, like *b*, but the latter is formed with the nose closed. Hence the passage of *m* to *b* (as in *lamb*) is easy; so also is that from *n* to *t*, or from *n* to *g*, as is seen in the frequent combination of *nt* and *ng* in most languages. The sounds of *l* and *r* (letters which Max Müller places in a special group under the name of *trills*) are produced, according to Helmholtz, as follows: "In pronouncing *r*, the stream of air is periodically entirely interrupted by the trembling of the soft palate, or of the tip of the tongue, and we then get an intermittent noise, the peculiar jarring quality of which is produced by these very intermissions. In pronouncing *l*, the moving soft lateral edges of the tongue produce, not entire interruptions, but oscillations in the force of air."—*Die Lehre von den Tonempfindungen*, 1863, p. 116. The *third* class contains sounds which scarcely deserve to be called consonants, since they are merely *aspirations*, either simple, or modified by an elevation of the tongue, causing a slight obstruction to the passage of air, and an increased resonance in the back of the mouth. The present *h* and the Greek *χ* are examples of these sounds. The method of pronouncing these sounds is very fully discussed in Max Müller's lectures, 2d series, pp. 127–136.

For further details, the reader is referred to the admirable chapter on "Voice and Speech" in Carpenter's *Human Physiology*, and to Max Müller's *Lectures on the Science of Language* (from both of which we have borrowed largely in this article), to Mr. Bishop's article "Voice" in the *Cyclopædia of Anatomy and Physiology*; and the various works of Funke, Helmholtz, Brücke, Czermak, Du Bois Reymond, etc., mentioned by Max Müller in his chapter on "the Physiological Alphabet."

VOIDED, in heraldry, a term applied to an ordinary when its central area is removed, so that the field is seen through it, and little but a mere outline remains.—*Azure*, a saltire voided argent. When the ordinary has its outer edge formed of any of the lines of partition other than dancetté, wavy, or nebuly, the voiding is nevertheless plain.—*Azure*, a chevron engrailed voided or. An ordinary voided and coupé differs from an ordinary coupé and voided in so far as the former is open at the extremities and the latter inclosed. One ordinary may sometimes be voided in the form of another, as a cross voided per pale.

VOIRE DIRE (*veritatem dicere*). In English law, when a witness is supposed to be liable to objection for incompetency or otherwise, he is first sworn, not in the cause, but on the *voire dire*, that is, to answer questions relating to this incompetency; and if it is apparent that he is incompetent, he is discharged without further examination.

VOIRON, a t. of France, in the department of Isère, beautifully situated on the Morge, 15 m. by railway n.w. of Grenoble. Among the manufactures which are here carried on with great activity are to be mentioned blacksmiths' work, paper-making, nail-making, and tanning. Pop. '76, 7,909.

VOITURE, VINCENT, 1598–1648; b. France; entered the service of Gaston of Orleans, who sent him to Spain to procure assistance from the count of Olivarez against the king. He afterward held several offices at court. He was elected to the French academy in 1634. He was an *habitué* of the hôtel Rambouillet, where his wit made him a favorite. His letters have been much admired.

VOLANT, in heraldry, flying. A bird volant is represented flying bendways toward the dexter side of the shield; and its position may be distinguished from that of a bird rising by the legs being drawn up toward the body.

VOLCANOES are conical mountains which vomit flame and smoke, and occasionally throw out showers of ashes and stone, or eject melted rock on the surface of the earth. Volcanoes may have their origin on flat plains on the surface of the earth, or even at the bottom of the sea; but the gradual accumulation of the ejected material around the vent, through which it has been poured, forms in time a mountain, if it is allowed to remain

The waves swept away the cone of Grahame's island (q.v.), which in 1831 appeared in the Mediterranean scattering the lava and scoriae of which it was composed at the bottom of the sea. When, however, the ejected materials are sufficiently compact to resist the action of the waves, a permanent island is produced, and sometimes increases in height with a rapidity that can scarcely be imagined. In 1796 a volume of smoke was seen to rise from the Pacific ocean about 30 m. to the n. of Unalaska. The ejected materials having raised the crater above the level of the water, flames issued from the islet, which illuminated the country for 10 m. around. Six years afterward, when a few hunters landed on the new island, they found the soil in some places so hot that they could not walk upon it. Repeated eruptions have increased the dimensions of the island, until now it is several thousand feet in height, and between 2 and 3 m. in circumference. In the same region is the volcanic island of Kliutschewsk, which rises at once from the sea to the enormous height of 15,000 feet.

The lava, scoriae, and ashes which are thrust out of the crater form highly inclined and more or less regular beds on the surface of the mountain, extending from the crater-mouth to varying distances down the sides of the volcano. This method of increase gives the uniform conical outline to volcanoes, without the terraces or breaks which are found in almost all other mountains. The sides are often furrowed longitudinally by straight narrow ravines, which increase in number toward the base. These are produced by the action of running water obtained from rain or from melting snows during an eruption. The rapidity with which floods rush down the steep sides of a volcano gives a prodigious force, which the loose scoriae and ashes, and even the solid lava, cannot resist.

The grayish color of volcanic mountains is produced by the ash and scoriae, which, though in composition the same as the dark lava, have this lighter color from the minute subdivision of their particles. When a particular series of rocks remain on the surface, and are not covered by the products of more recent eruptions, they weather and decompose, and produce a very fertile soil, which is speedily clothed with vegetation, and thus change the whole aspect of the formerly bare and uniformly-colored mountain.

The vent through which the materials are vomited forth is called the crater. This is a more or less circular opening, communicating with the source from which the ejected materials are obtained. The crater has generally one side much lower than the other—that from which the prevailing wind blows, which carries with it the showers of ashes to the opposite side of the mountain. In many cases, the cone is truncated; a wide hollow of immense extent, and often of great depth, in the base of which the crater is situated, occupies the summit. The Spanish name *caldera* is technically applied to these hollows. Their origin has been a subject of considerable controversy. Von Buch and others maintain that they are craters of elevation; that is, that the rocks were originally spread out in nearly horizontal deposits, and then upheaved into a dome-shaped mountain, with the hollow caldera in the center of its summit. The more satisfactory explanation is that the original cone, formed by the alternate deposition of the lava and ashes ejected from the crater, has, from the great heat of the molten lava rising in the tube of the volcano, or from gaseous explosions, given way, and fallen in. The cones both of Etna and Vesuvius have frequently fallen in and been reproduced. In 1822 the summit of Vesuvius was reduced by 800 feet. The immense size of some calderas seems, however, opposed to this theory. That of the island of Palma, one of the Canaries, is from 3 to 4 geographical m. in diameter, and the precipices which surround the cavity are from 1500 to 2,000 ft. in vertical height. They form an unbroken wall, except at the south-western end, where a deep gorge permits the passage of the torrent which drains the caldera. The precipices are traversed by numerous vertical dikes, and exhibit all the appearances which would be produced by the falling-in of the huge summit of this once enormous volcano.

The pressure of the incandescent lava often forces for itself a passage to the surface before it reaches the mouth of the crater, and this is more frequently the case when the volcanic eruption is accompanied with earthquakes. Immense vertical fissures are found radiating from the center of the volcanic action, and reaching the surface of the ground, and even rising to the summit of the mountain; these being filled with the molten rock, which in course of time solidifies and forms often a large portion of the mountain mass, as is shown in the Val del Bové on Etna (q.v.). The lava sometimes pours out of these fissures instead of rising to the crater. In 1783 during a terrible eruption of Heda, a prodigious stream of lava flowed from a lateral crevice; moving slowly down the mountain-side, it reached a distance of 50 m. in 42 days; it then branched into two main streams, the one running 40 m. and the other 50 m. further toward the sea. Its depth varied from 600 to 1000 ft., and its greatest width was 15 miles. The amount of lava poured out into this stream would almost equal Mont Blanc in bulk.

The power which exhausts itself in the eruption of a volcano often shows itself by changes which it produces in the level of the country around. About a hundred years ago, a volcano appeared in the center of the great table-land of Mexico, and raised an area of nearly 4 sq. m. 550 ft. higher than it was before, covering it at the same time with conical hills of various heights, the highest of which is Jorulla, which is 1600 ft. high. But sometimes a subsidence takes place. In 1772 a great part of the Papandayang, a mountain in Java, was swallowed up; the inhabitants of its declivities were sud-

denly alarmed by tremendous noises in the earth, and before they had time to retire, the mountain began to subside, and soon disappeared. The area thus sunk was 15 m. long and 6 broad.

A volcanic eruption is generally preceded by rumbling noises and slight movements in the earth; then fitful puffs of gases and steam are given off. These contain much sulphur, and some volcanoes give out such quantities of carbonic acid and other mephitic gases as to destroy the animals in the neighborhood. Sir William Hamilton picked up dead birds on Vesuvius during an eruption; in 1730, all the cattle in the island of Lancerota, one of the Canaries, were destroyed by these deleterious emanations. The Upas valley in Java contains an extinct crater; and the certain death which overtakes every animal that penetrates the valley is due to the noxious gases given out from it, and not to the *antiaris*, which, though yielding a deadly poison, does not affect the atmosphere in which it grows. The eruption itself begins, perhaps, with the ejection of the finest dust, and that with such a force as to project it high into the atmosphere, where, taken up by air-currents, it is often carried to enormous distances. In 1845, the dust from Hecla was in ten hours thickly deposited on some of the Orkney and Shetland islands; the ashes from Consequina fell, in 1835, on the streets of Kingston, Jamaica, at a distance of 700 m.; and during the same eruption, the fine dust covered the ground at a distance of nearly 30 m. to the s. of the volcano, to a depth of more than 10 ft., destroying the woods and dwellings, and enveloping thousands of quadrupeds and birds.

The flames seen issuing from the crater are usually the reflection of the glowing lava emitted from the crater, and illuminating the clouds of vapor, scoriae, and ashes.

Lava and scoriae are at last vomited forth. Sir William Hamilton says that, in 1779, the jets of liquid lava from Vesuvius, mixed with scoriae and stones, were thrown to a height of 10,000 feet, giving the appearance of a column of fire. The lava, however, generally issues from openings in the side of the mountain. It pours forth in a perfectly liquid state, bright and glowing with the splendor of the sun. At first, it flows rapidly; but as its surface becomes cooled and converted into slag, its velocity diminishes. It has to burst the indurated coating before it can continue its progress, and the liberated lava when it flows bears on its surface masses of scoriae, looking like the slag from an iron furnace.

The materials ejected from a volcano, though differing greatly in appearance, have the same mineral composition. The ash is merely the pumice in a very fine state of division, and the pumice also is only lava made vesicular from contact with air or water.

The theories propounded to account for volcanic action are either chemical or geological. Sir H. Davy suggested that if immense quantities of the metallic bases of the earths and alkalis were present in the interior of the earth, all the phenomena would be produced by their oxidation from contact with air or water. Although the distinguished author of this theory abandoned it, it has since been taken up and advocated by Daubeny and others. Bischof, assuming that the interior of the earth consists of a highly heated and fused mass, considers that the mechanical action of water, converted into steam by the great heat, would produce volcanic action. Both theorists seek support for their views from the fact, that the great majority of volcanoes are situated on or near the sea-coast. Geologists accepting also the doctrine of internal heat, and believing that at a certain depth the rocks of the earth are, partially at least, in a state of fusion, explain volcanoes by considering them as connections established between the interior of the earth and the atmosphere, the elastic force of steam being the propelling power. Darwin, from observations made in all parts of the world, believes that volcanoes are chiefly, and, indeed, almost only, found in those areas where subterranean motive-power has lately forced, or is now forcing upward, the crust of the earth, and are invariably absent in those where the surface has lately subsided, or is still subsiding.

Volcanic action is limited to particular regions of the earth. In these regions, the active vents are distributed at intervals, and are generally arranged in a linear direction. The Pacific ocean is bounded by an almost unbroken line of active volcanoes. Beginning in the New South Shetlands, where there is an active volcano in lat. 63° 55' s., we pass to Terra del Fuego, and then on to the Andes, which are throughout their whole course volcanic, although the great centers of present action are confined to Chili, Peru, the neighborhood of Quito, Guatemala, and Mexico. The line is continued northward by the burning mountains of north-western America, and the Aleutian islands carry the chain across to Kamchatka on the Asiatic side. Here, turning southward, the line may be traced through the Kurile islands, Japan, Formosa, the Philippines, Moluccas, New Guinea, and the Salomon and New Hebrides groups, to New Zealand. From Celebes, a branch proceeds in a north-westerly direction through Java and Sumatra, to Barren island in the bay of Bengal; and even beyond this we find a region in northern India subject to earthquakes, which may lead us, on the one hand, to the volcanic region in Tartary, or, on the other, through Asia Minor to the Greek archipelago, Sicily, Naples, and on to the Canaries and cape de Verd. According to the geological theory, the lines thus traced over the globe would represent rising lands, where the crust is less strong, and so less liable to repress the expansive powers below. There are a number of isolated volcanoes also scattered over the surface of the earth. These are supposed to have opened a star-shaped communication with the interior. The most remarkable of

these isolated volcanoes are Jan Mayen, in lat. $70^{\circ} 49'$ n., and those in Iceland in the north, and mount Erebus in s. Polarland, in lat. $77^{\circ} 32'$ s.

VOLCANOES (*ante*). The volcano is a conspicuous object of inquiry, since its action embraces all the phenomena connected with the expulsion of heated materials from the interior of the earth to the surface. Volcanoes may break through any kind of geological formation. In Auvergne, in the miocene period, they burst through the granitic and gneissose plateau of central France; in the period of the lower old red sandstone they pierced Silurian rocks in Scotland; in the late tertiary and post-tertiary ages they found their way through the marine strata, and formed such huge piles as Etna and Vesuvius; on the banks of the Rhine they have penetrated some of the older alluvia of the river. In many instances new volcanoes have appeared on the site of old ones. In Scotland the carboniferous volcanoes have risen on the sites of those of the old red sandstone. Somma and Vesuvius have arisen from the great Neapolitan plain of marine tufa. It is usual to class volcanoes as active, dormant, and extinct. The active volcano cannot be mistaken; but in many cases it is impossible to determine whether a volcano is extinct or only dormant. The volcanoes of the Silurian age in Wales, of the carboniferous age in Ireland, of the Permian age in the Hartz, and of the miocene age in the Hebrides, are certainly extinct. But the miocene volcanoes of Iceland are still represented by Skaptar-Jökull and Hecla. Somma, in the first century of the Christian era, would have been regarded as an extinct volcano; its fires had never been known to have kindled; its vast crater was a wilderness of vines and brushwood, the haunts of the wild boar and the wolf. Yet in the autumn of the year 79 A.D., half of the wall of the crater was blown out by a series of terrific explosions, the present Vesuvius was formed within the limits of the old crater, and the cities of Pompeii and Herculaneum were buried. From that day to the present the volcano has been active, although there have been long intervals of quiet. Between the years 1500 and 1631 it was entirely dormant, and the crater was overgrown with vines and brushwood. Near the close of 1631, however, there came an eruption never equaled except by the one of 79.

The materials thrown up by volcanic action are: 1. Gases; 2. Lavas; 3. Fragmentary substances. Gases and vapors are the earliest development, and steam is the most abundant of all. In great eruptions it rises in enormous quantities and rapidly condenses into rain. It has been calculated that in a hundred days Etna threw up enough vapor to make 200,000,000 barrels of water. This vapor is mixed with various materials, the most abundant being sulphureted hydrogen, which is the chief cause of the deposits of sulphur around vents. At Vesuvius and some other volcanoes hydrochloric acid appears. Carbonic acid is sometimes given off so abundantly that birds and small animals have been suffocated by it. Nitrogen has also been detected. With these gases and vapors are associated many substances which, sublimated by the volcanic heat, appear as deposits along crevices and surfaces where they reach the air and are cooled. These are sulphur, sal-ammoniac, specular iron, oxide of copper, boracic acid, and the chlorides of sodium, iron, copper, and lead. The chloride of sodium is sometimes so abundantly deposited as to form valuable mines of salt. Among the phenomena of volcanic action may be mentioned the abundant discharge of water. The sources of such water are melting snow, the condensation of the great volumes of steam, and the disruption of reservoirs of water in subterranean recesses. The volcanoes of South America often throw up great quantities of dead fish, which seems to indicate a connection with the ocean. There is a volcano in Guatemala that throws out nothing but water. In one of the volcanoes of Java there is a hot steaming lake of acid water. Early in 1817 an eruption took place by which great destruction was caused. After the explosion the temperature of the water in the basin was greatly reduced. Sometimes the water and the dust are thrown up united and form what are known as mud volcanoes; but these are rare.

One of the greatest products of volcanic action is lava, by which is meant the molten matter which flows from the mountain. When cooled, lava is a light porous stone of sp.gr. 2.37 to 3.22, containing a variety of mineral substances. Lavas differ greatly in texture; some are crystalline, some are half glassy or stony; others are vitreous. They also vary in color and in general external aspect. Their surface is commonly rough and rugged until it has been sufficiently decomposed to crumble into excellent soil, which, under favorable circumstances, will support a luxurious vegetation.

Volcanic action may be either constant or periodic. Stromboli in the Mediterranean has been uninterruptedly emitting hot stones, steam, and lava from the dawn of history. Other constant volcanoes are known in the Moluccas and the Friendly islands. The cone of Sangay in Quito perpetually gives off hot vapors, and Cotopaxi in Mexico is constantly active. But the general rule is that a volcano has intervals of greater or less fury, and followed by intervals of quiescence. The eruptions of Vesuvius are often preceded by a failure or diminution of the wells and springs in the neighborhood; but more frequent indications of an approaching outburst are conveyed by sympathetic movements of the ground beneath. Rumbles and groanings are heard from below; slight tremors succeed, increasing in frequency and violence till they become distinct earthquake shocks. The vapors from the crater rise more abundantly into the air. All this time the lava column in the pipe or funnel of the volcano has been slowly ascending, forced upward and kept in perpetual agitation by the passage of the elastic vapors through its mass. After a long interval of quiescence has elapsed, the vent may contain much solid lava which will confine the melted part beneath. A vast pressure is thus

exerted on the sides of the cone. Should these be too weak to resist, they will open in one or more rents, and the liquid lava will issue from the outer slope of the mountain: or the energies of the volcano will be directed toward clearing the obstruction in its throat, until, with tremendous explosions, and vast clouds of dust and fragments, the bottom and sides of the crater are blown out, and the top of the cone disappears. The lava may now pour over the lowest part of the lip of the crater, while, at the same time, immense quantities of red-hot bombs, scoriæ, and stones are shot up into the air, most of them falling back into the crater, but many descending upon the outer slopes of the cone, and some even upon the country beyond the base of the mountain. The lava rushes down at first like a river of molten iron, but, as it cools, its rate of motion lessens. Clouds of steam rise from its surface, as well as from the central crater. Indeed, every successive paroxysmal convulsion of the mountain is marked, even at a distance, by the rise of huge ball-like wreaths or clouds of steam mixed with dust and stones, forming a vast column which towers sometimes a couple of miles above the summit of the cone. By degrees these diminish in frequency and intensity. The lava ceases to flow, the shower of stones and dust dwindles down, and after a time, which, with the same mountain, may vary from hours to days or months, the volcano becomes tranquil.

The violence of volcanic explosions is remarkable. The history of the cone of Vesuvius brings before us a long series of such explosions beginning with that in 79 A.D., which was the greatest known in human history. Even now, in spite of all the ashes and lava poured out during the last 1800 years, it is easy to see how stupendous must have been that explosion by which the southern half of the crater was blown out. At every successive important eruption a similar operation takes place within the present cone. The hard cake of lava forming the floor is burst open, and with it there usually disappears much of the upper part of the cone, and sometimes, as in 1872, a large segment of the crater wall. In 1558 a new volcano was formed on the shores of the bay of Naples. A cavity was made by successive explosions and such quantities of stones, scoriæ, and ashes thrown from it as to form a hill 440 ft. above the sea level and more than 8,000 ft. in circumference. Showers of dust and stones are a conspicuous feature of volcanic eruptions. Instances are known where stones eight pounds in weight have passed through enormous parabolic curves in the air and fallen at a great distance. Such stones are found in the ashes that entombed Pompeii. But in many great eruptions, besides a constant shower of stones and scoriæ, a vast column of exceedingly fine dust rises out of the crater, sometimes to the height of more than a mile, and then spreads outward like a sheet of cloud. So dense sometimes is this dust-cloud that the sun is obscured, and for days together the darkness reigns for miles around the volcano. In 1822 this was the case at Vesuvius, the ashes not only falling thickly on the villages around the base of the mountain, but traveling as far as Ascoli, 56 Italian m. from the mountain on one side, and to Casona, 105 m. away on the other side. But probably the most stupendous outpouring of volcanic ashes on record was that which took place after a quiescence of 26 years from the volcano of Con-seguina, in Nicaragua, during the early part of 1835. On that occasion utter darkness prevailed over a circle of 50 m. in diameter, the ashes falling so thickly that even 24 m. from the mountain they covered the ground to a depth of 10 ft. It was estimated that the rain of dust and sand fell over an area of 270 geographical m. in diameter. Some of the finer materials thrown so high as to come within the influence of the upper air current were blown away to the e. and fell four days afterward on the island of Jamaica, 700 m. away. Bombs, slags, and lapilli may be thrown up when the volcano is comparatively quiet, but dust-showers are always discharged with violence. Thus in the constant but comparatively quiet action of Stromboli the column of the lava in the pipe may be seen rising and falling with a slow rhythmical motion. At every rise the surface of the lava swells up into blisters several feet in diameter which by and by burst with a sharp explosion that makes the walls of the crater vibrate. A cloud of steam rushes out, carrying with it hundreds of fragments of the glowing lava, sometimes to the height of a quarter of a mile. It is by the ascent of steam through the mass that a column of lava is kept boiling at the bottom of the crater, and by the explosion of successive larger bubbles of steam that the various bombs, slags, and fragments of lava are torn off and tossed into the air. It has often been noticed at Vesuvius that, after each great convulsion, a huge ball-like cloud of steam rises from the crater. Doubtless it is the sudden bursting of that steam which causes the explosion. Explosions and accompanying scoriæ are abundant in Vesuvius, where the lavas are comparatively viscid; but they are almost unknown at Kilaua, where the lava is remarkably liquid.

No part of the operations of a volcano has greater significance than the ejection of such enormous quantities of fragmentary matter. In these deposits are buried trees, the bodies of animals, and the works of man. Besides the distance to which fragments may be hurled by volcanic explosion, or to which they may be diffused by the air, we have to take into account the vast spaces across which the finer dust may be borne by upper aerial currents. On several occasions ashes from Icelandic volcanoes have fallen so thickly between the Orkney and the Shetland islands that vessels there at sea have had the strange deposits shoveled off their decks. In 1783 Skaptar-Jökull ejected so much fine dust that the atmosphere of all Iceland was loaded with it for months afterward. It fell in such quantities over Caithness, a distance of 600 m., as to destroy the crops, and the period is still remembered in Scotland as "the year of

the ashie." Traces of the same deposit were observed as far as Holland. It is not therefore to be held that a volcanic deposit indicates proximity to a volcanic center, since it may have drifted from another center hundreds of miles away.

Lava streams usually consist of glass through which are diffused microlites; and well-defined crystals of leucite may be seen in specimens of Vesuvius lava which have been dipped from a white-hot stream and suddenly congealed. The green pyroxenic lava of Hawaii exhibits so extreme a degree of fluidity that, during its ebullition in pools of the crater, jets not more than a quarter of an inch in diameter are tossed up, and falling back on one another, make a column of "hardened tears of lava," while in places the jets thrown up and blown aside by the wind give rise to long threads of glass which lie thickly together like mown hay. The natives call this "Pele's hair," after one of their divinities. At its first appearance, where it issues from the mountain, the lava glows with a white heat, and flows with a motion which has been compared to that of honey or of melted iron. It soon becomes red, and, like a coal fallen from a hot fireplace, rapidly grows dull as it moves along, until it assumes a black, cindery aspect. At the same time the surface congeals, and soon becomes solid enough to support a heavy block of stone. Its aspect depends, not merely on the composition and fluidity of the lava, but on the point of egress, whether from the crater or from a fissure, on the form of the ground, the angle of slope, and the rapidity of flow. Lavas which have been kept in ebullition within the central chimney are apt to acquire a rough cellular texture. The surface of the moving stream breaks up into rough brown or black cinder-like slags, and irregular rugged cakes, which, with the onward motion, grind and grate against each other with a harsh metallic sound, sometimes rising into rugged mounds or becoming seamed with rents and gashes, at the bottom of which the red-hot glowing lava may be seen. When lava escapes from a lateral fissure it may have no scoriae, but its surface will present froth-like, curving lines, as in the scum of a slowly flowing river, or will be arranged in curiousropy folds as the layers have successively flowed over each other and congealed. These and many other fantastic coiled shapes were exhibited by the lava which flowed from the side of Vesuvius in 1858. A large area which has been flooded with lava is perhaps the most hideous and appalling scene of desolation anywhere to be found on the surface of the globe. A lava stream at its point of escape from the side of a volcanic cone occupies a comparatively narrow breadth; but it usually spreads out as it descends, and moves more slowly. The sides of the moving mass look like huge embankments, or like some of the large mounds of "clinkers" one sees in a manufacturing district. The advancing end of the mass is often much steeper, creeping onward like a great wall or rampart, down the face of which the rough blocks of hardened lava are ever rattling. The rate of movement is regulated by the fluidity of the lava, by its volume, and by the form and inclination of the ground. Hence, as a rule, a lava-stream moves faster at first than afterward, because it has not had time to stiffen, and its slope of descent is considerably steeper than further down the mountain. One of the most fluid and swiftly-flowing lava streams ever observed on Vesuvius was thrown out Aug. 12, 1805. It is said to have rushed down a space of 3 Italian ($3\frac{1}{2}$ English) m. in the first 4 minutes, but to have widened out and moved more slowly as it descended, and finally to have reached Torre del Greco in 3 hours. A lava stream thrown out by Mauna Loa in 1852 went as fast as an ordinary stage-coach, or 15 m. in 2 hours. Long after a current has been deeply crusted over with slags and rough slabs of lava it continues to creep slowly forward for weeks or even months. The hardened crust of a lava current is a poor conductor of heat. In the case of Jorilla, a volcano in Mexico, lava was sent out in 1759, and 21 years afterward cigars could be lighted at the fissures in the deposit; after 44 years the lava still sent up steam, and after 87 years two vapory columns were still rising. No sure means have been found to ascertain the temperature of lava at the moment of discharge; but the slow rate of cooling has been regarded as of high geological significance in regard to the cooling and probable internal temperature of the globe.

Besides slags, dust, and lava, sometimes large quantities of water and mud accompany volcanic eruptions. During the eruption of Vesuvius in 1662 a torrent of water and mud poured down, overthrowing the houses and burying the inhabitants of villages. Near the foot of the mountain Roman cities were overwhelmed in the 1st century. In 1691 one of the volcanoes of Quito threw up mud and water so filled with dead fish as to cause a pestilence. Even more destructive outpourings have taken place in the volcanoes of Java, where wide tracts of luxuriant vegetation have at different times been buried under masses of dark gray mud sometimes 100 ft. thick. Mud volcanoes, perhaps not strictly volcanic, have periods of repose, when no discharge takes place, or the mud oozes tranquilly from the orifice, with shocks of activity, when large volumes of gas and sometimes columns of flame rush out with violence, throwing up mud and stones. The mud is usually cold. Among the products of such volcanoes are naphtha, inflammable gas, and sulphur. There are also many remarkable discharges of gases from the earth which seem to come from volcanic action. The most remarkable of these is in Java, known as the Valley of Death. There is a deep bosky hollow, in which from one small space on the bottom carbonic acid issues so copiously as to form the lower stratum of the atmosphere. Animals enticed by the seclusion and shelter of the spot pass in and are suffocated. This is the place that was long known as the val-

ley of the Bohon Upas, and the poison was supposed to come from a tree called by that name. Hot springs are another effect of volcanic action. They are widely distributed over the earth, but the most remarkable are in Iceland, and in Yellowstone park, in the territory of Wyoming, United States. These springs are usually intermittent in action, but explode at regular intervals, throwing up quantities of water and steam. The water usually contains silica in solution, which is deposited around the springs and forms their craters. In the Great geyser in Iceland the water is at boiling point (212°) at the surface, while a few yards below it is 266° Fahrenheit. See GEOLOGY. [The foregoing is in substance from *Encyclopædia Britannica*, ninth edition.]

VOLE, *Arvicola*, a genus of rodent quadrupeds, of a group which some naturalists constitute into a family (*arvicolida*), but which is more generally regarded as a tribe or sub-family of *muride* (q. v.). This group is characterized by a thicker and shorter form than that of the true rats and mice; an obtuse muzzle; ears of moderate size; a round and hairy tail, not so long as the body; the molar teeth with flat crowns, which present angular enameled plates. These characters exhibit an approach to the beaver family (*castoridae*). The lemmings (q. v.) belong to this group. The species are numerous, and widely distributed, being found in Europe, Asia, Africa, and North and South America. Some of them are completely terrestrial in their habits, others are aquatic. Many are popularly called rats and mice, as the species of the genus *arvicola*, which are found in Britain. In this genus the teeth are only ten in number; two incisors and three molars in each jaw. One of the most common British species is the FIELD VOLE (*A. agrestis*), also known as the MEADOW MOUSE and SHORT-TAILED FIELD MOUSE. The whole length of the head and body is scarcely more than 4 in., that of the tail rather more than an inch and a quarter. The field vole has a large head, a very obtuse muzzle, ears just appearing above the fur, the thumb of the fore-feet rudimentary, and without a claw. The upper parts are reddish brown, the under parts ash-color, the feet and tail dusky. It burrows in the ground, or finds a retreat for itself in the excavations of some other animal, as of the mole. It chiefly inhabits low and damp situations, and dry seasons are very fatal to it. It produces from five to seven young at a birth. It is sometimes very injurious to plantations, by destroying the roots of trees and devouring their bark. Excessive numbers of this little animal were regarded in 1813 and 1814 as threatening the destruction of the forest of Dean, and the new forest in Hampshire; and many trees were killed; but a remedy was found in digging pits into which the voles fell, and from which they could not escape. The same method has been successfully employed in some of the forests of continental Europe. This species of vole is found in most parts of Europe, and in many parts of Asia. It is common in the Himalaya.—Another very common British species is the WATER VOLE (*A. amphibio*), popularly known as the WATER RAT, a much larger animal, the head and body being about 8½ in. in length, and the tail 4½ inches. The head is thick and short, the muzzle very obtuse, the eyes small, the ears scarcely seen beyond the fur; the last joint only of the thumb of the fore-feet conspicuous beyond the skin. The fur is thick and shining, of a rich reddish brown mixed with gray above, yellowish gray beneath. Although the feet are not webbed the water vole swims extremely well, and not only at the surface of the water, but often under it. It burrows in the banks of streams, ditches, and ponds. Its food appears to consist chiefly of aquatic plants, although it objects to no kind of vegetable food, and has been known to store up potatoes in its burrow for winter. It has been supposed also to feed on worms, frogs, and small aquatic animals, and to be destructive to the spawn of fish; but this is very doubtful. This species is widely diffused over the continent of Europe. There is a black variety of it, common in some parts both of England and Scotland, which has been described as a distinct species (*A. atra*). Several species of vole are found in North America.

VOLGA, the most important river of Russia, and the longest in Europe, has its origin in a marshy plain among the Valdai hills, in the government of Tver; lat. 57° n., long. 33° 10' east. From its source, which is 550 ft. above ordinary sea-level, and 633 ft. above the level of the Caspian sea, into which it falls, the river flows s.e. to Zubzov, then n.e. past Tver and Koliazin to Mologa, where it turns e.s.e., and flows in that direction past Jaroslav, Kostroma, Nijni-Novgorod, and Kazan, 50 m. below which, on receiving the Kama, it turns s., passing Simbirsk, Stavropol, and Samara. Here its course again changes to s.w., and in this direction the river flows until it reaches Tzaritzin, when it bends to the s.e., and reaches the Caspian sea, which it enters by many mouths, and after a course of 2,320 miles. The Volga waters 9 governments—those of Tver, Jaroslav, Kostroma, Nijni-Novgorod, Kazan, Simbirsk, Saratov, Samara, and Astrakhan; but besides these, 12 other governments are watered by its tributaries. The course of the stream is generally divided into three parts—the upper part reaching from its source to its confluence with the Szekna, and, though presenting many hindrances to navigation, yet capable of being traversed from Tver to Rybinsk by craft of 1½ and 2 ft. draught; the middle part, from Rybinsk in Jaroslav to Nijni-Novgorod, navigable for larger craft; and the lower Volga from Nijni-Novgorod to Astrakhan—where it is about 90 ft. deep—navigable for the largest vessels. Below Astrakhan the Volga is very much shallower—in some places only 1½ ft. deep. At Tver the breadth of the river is 720 ft.; at Mologa, 2,060 ft.; at Nijni-Novgorod, 2,069 ft., but sometimes in the spring 2½ m.

broad; at Simbirsk, about a mile broad; between Samara and Sysran, from 1 to 3 m. broad. Below Tzaritzin, at the confluence of the Sarpa, the river affords few facilities for navigation, and is remarkable for the number of branches into which it divides itself before it enters the Caspian sea. The banks of the Volga, which are elevated in the upper and middle reaches, become much lower as the river approaches its embouchure. The chief ferries and commercial towns on the Volga are: Rjev, Zubzov, Tver, Koliazin, Uglitch, Mologa, Rybinsk (the great center of the corn trade), Jaroslav, Kostroma, Nijni-Novgorod, Kazan, Simbirsk, Samara, Tzaritzin, and Astrakhan. The system of water-communication established by the Volga and its tributaries, is of the greatest importance to the commerce of Russia, connecting as it does the central districts of the country with the White sea by means of the canal of the prince of Wurtemberg; with the Baltic by the three canal-systems of Tichvin, Vishni-Volotchek, and Mariinsk; with the Black sea by the Upa canal, which connects the Oka and the Don; with the Caspian sea by the great stream of the Volga itself; and with Siberia by the rivers Kama and Tchussovana. The principal affluents on the right are the Oka (q.v.) and the Sura; on the left, the Tvertza, Mologa, Szeksna, and Kama (q.v.).

VOLHY NIA, a frontier government of west Russia, bounded on the s.w. by Galicia, and on the w. by Poland, from which it is separated by the river Bug. Area, 27,348 sq.m.; pop. 70,170,4018, mostly Russians, Poles, Lithuanians, Jews, Germans, and Tartars. The surface in the n. of the government is low, and plains and morasses covered with forests abound; in the s. there are hills, branches of the Carpathian mountains, but which do not rise higher than 1230 feet. Almost all the rivers flow n. and join the Pripet, an affluent of the Dnieper; a few streams, however, flow w. and join the Bug, by means of which river timber is floated down from this river to Prussia. The soil is sandy or clayey; agriculture flourishes in the s., and corn is exported to Odessa, Galicia, Poland, and partly to Great Russia. Cattle-breeding has always been a prosperous branch of industry in Volhynia until recently, but a fine breed of sheep are still reared, and the government possesses the finest studs in the empire—those of the princes Sangousko and Tzartorsky. Of the woods, which form the principal riches of the n. districts, fir is the chief. The forests abound in foxes, hares, and bears, and hunting is a favorite pastime. Many sugar mills, cloth factories, and distilleries are in operation, and the manufactures are increasing yearly. Corn, cattle, sheep, wool, cloth, linen, timber, honey, and wax are the principal articles of trade.

Volhynia in early times belonged to the ancient Russians, but was conquered by the Lithuanians and Poles in 1320, and remained in their hands till its annexation to Russia in 1798.

VOLLITION. See **WILL**.

VOLLEY, the simultaneous discharge of a number of small arms. The same operation from cannon is called a salvo.

VOLNEY, CONSTANTIN FRANÇOIS CHASSEBŒUF, Comte de, was b. at Craon, in Anjou, on Feb. 3, 1757. He was the son of an advocate of good reputation. His family name was Chassebœuf, but on arriving at manhood he assumed the additional surname of Volney. He got his preliminary education at the colleges of Ancenis and Angers, and afterward went through a protracted course of study at the university of Paris. His father wishing him to join his own profession, he spent some time in preparing for the bar; but he renounced law for medicine, which, however, he never practiced. He had inherited a competency from his mother, and soon after completing his studies, in the year 1783, he set out for Egypt, with the intention of traveling in Egypt and Syria. This expedition occupied him about 4 years. On his return to France in 1787 he published his celebrated *Travels in Syria and Egypt*, which still contain the most trustworthy as well as one of the liveliest and most interesting accounts which have been published of the tribes with which he came in contact. This work at once procured him a great reputation. At first there was a disposition to question the veracity of some of his descriptions, but their truthfulness was fully confirmed when the French became more familiar with the Egyptians and the Arabs through the expedition of 1796. The sagacity of the chief political conclusions to which his residence among these peoples had brought him, which in 1788 he embodied in a pamphlet—*Considerations on the War between the Turks and the Russians*—has also been shown by subsequent events. In 1790 he was elected to the *etats-généraux* as a member for his native district, and took a somewhat prominent part in the political discussions of the years which followed, showing himself as he has done in his works a fast friend of the public liberties, a mocker at all systems of religion, and at the same time a fearless opponent of popular excesses. He was imprisoned for his outspokenness in 1793, and was not liberated till after the downfall of Robespierre in July of the following year.

In Sept., 1794, Volney published his *Ruins; Reflections upon the Revolutions of Empires*, upon which and upon his *Travels* his reputation chiefly rests. Volney believed that political, like all other organizations, are subject to decay and destruction. The discussions contained in the *Ruins* cover almost all the radical questions in politics. Its principles are those of 1789. It vindicates the doctrine of the rights of man, establishes the duty of toleration in matters of opinion, and maintains, with perhaps too much of

sarcasm and mockery, the human origin and the essential falsity of all religious systems. In the previous year Volney had published his *Natural Law*, a catechism for a French "citizen," in which he treats morality as a physical and material science, to be studied upon the same methods as the other natural sciences, and having no object but the conservation and improvement of society. This work was afterward republished under the title of the *Physical Principles of Morality*.

Toward the close of 1794 he was appointed professor of history in the short-lived *ecole normale*; and the brilliant discourses, not untinged with paradox, which he delivered in this capacity made a sensation in Paris even at that unsettled time. On the suppression of the *ecole normale* in 1795 he went to the United States, intending to spend the remainder of his days there; but circumstances made his residence there extremely disagreeable to him, and he returned to France in the spring of 1798. In his absence he had been elected a member of the institute; he was soon after his return admitted to the academy; and henceforth his life, though not inactive, was prosperous and untroubled. He had early been acquainted with Bonaparte, and had been of service to him at the time when political circumstances had deprived him of employment; and Bonaparte, on becoming first consul, desired to associate him with himself in the government as consul or as minister of the interior. Volney refused both offices, but accepted a seat in the senate. He protested against the establishment of the empire and resigned his seat in the senate; but his resignation was declined, and during the existence of the empire he formed one of the little band, sneered at by Napoleon as *idéologues*, who in the senate attempted by their criticisms to restrain the arbitrary conduct of the emperor. Henceforth, however, his occupations were mostly literary. He published *Researches into Ancient History*, several of the papers contained in which were written in the earlier part of his career; and also several linguistic works, in which he attempted to popularize, and, by means of a universal alphabet, to simplify the study of the eastern languages. He had accepted from Napoleon the title of count and the commandship of the legion of honor, and upon Napoleon's downfall he was among those who were called to the house of peers by Louis XVIII. His latest work, published in 1819, was *The History of Samuel, the Inventor of the Sacredness of Kings*. Volney died April 25, 1820, shortly after completing his 63d year.

VOLOGDA, an extensive government of Great Russia, bounded on the e. by the Ural mountains, and on the n.w. by the government of Archangel. Area, 151,500 sq.m.; pop. '70, 1,003,039, chiefly Russians, but comprising also a few Finns, by which race this territory was inhabited in early times. The districts in the e. adjoining the Ural mountains, are traversed by branches of that chain, which rise to the height of from 3,000 to 4,000 feet. But by far the greater part of the government is occupied by marshy plains, covered with impenetrable forests. The soil is not fertile, except in the s.w. districts, which are the most densely peopled, and produce corn sufficient for local consumption and the supply of the distilleries. In the middle districts, there are comparatively few inhabitants; cultivated land is rarely seen, and hemp is the only crop produced liberally. The wooden morasses of the n. are inhabited only by Finnish tribes, engaged in hunting. The banks of the rivers are, as a rule, the only inhabited places. The principal rivers, fifteen of which are navigable, are the Northern Dwina, with its great upper waters, the Suchona, Jug, and Withegdá; and the Petchora, with its affluents. Lakes are numerous. Salt-works, iron-works, and distilleries are in operation; and salt, iron, skins, tallow-candles, and cheese are exported; and corn and manufactured goods imported.

VOLOGDA, a city of Great Russia, in the s.w. angle of the government of the same name, of which it is capital, stands on both banks of the river Vologda, 467 m. e. of St. Petersburg. It is said to have been founded in the 13th c. by settlers from Norgorod, to which principality it belonged down to the 15th c., when it was annexed to Moscow. In 1553, when England opened up a trade with Russia, through the port of Archangel, Vologda was the great entrepôt for goods deported n. by the Northern Dwina; and even yet it exports to St. Petersburg and Archangel various products of its own and neighboring governments, to a considerable amount. Wigello and filigree work are manufactured. Political offenders are sometimes banished to Vologda. Pop. '67, 17,859.

VOLSCI, an ancient Italian people, closely related to the Umbrians. See UMBRIA. Their territory was bounded on the w. by that of the Latini, on the n. they marched with the Æqui and Hernici, on the e. with the Samnites, and on the s. they had the sea. Along nearly the whole of their coast lay the Pontine marshes, while inland, their territory was somewhat mountainous. The Volsci were a brave and warlike people, who, frequently in alliance with the Æqui, were incessantly at war with the Romans for upward of 200 years previous to 338 B.C., about which time they appear to have been finally subdued, their territory incorporated into Latium, and they themselves created Roman citizens. See LATINI. These wars were very harassing to the Romans, as they were often carried on not so much by the Volsci as a whole, as by different cities, each frequently on its own account. Some of the chief towns, and those which took a principal part in the wars, were Antium, Velitæ, Satricum, Privernum, Ubbæ, Suessa, Pomcætia, Anxur, and Tarracina, and later Forum Appii and Tres Tabernæ. The legend of

Coriolanus (q.v.) is connected with the Volscian wars. See **ROME**, **TARQUINIUS SUPERBUS**, **ANTUM**. From the time of their final subjugation, their history belongs to that of Rome (q.v.).

VOLSK, or **VOLGSK**, a t. of European Russia, in the government of Saratov, on the right bank of the Volga, 80 m. n.e. of Saratov. Fat and skins are prepared and exported to St. Petersburg, and corn is exported in large quantities to Astrakhan and Rybinsk. The inhabitants are chiefly engaged in the culture of gardens and orchards, and the fruits grown are exported principally to Nijni-Novgorod. Pop. '67, 26,853.

VOLTA, **ALESSANDRO**, a celebrated Italian physicist, was born at Como, of a noble family, in 1745, and received an excellent education. In 1774, he was appointed professor of natural philosophy at Pavia, and continued to discharge the duties of this chair till 1804, when he retired to his native town, to spend the rest of his days. Volta, while but a youth, had exhibited considerable taste for letters, and had even written two poems, one in Italian, and the other in Latin; but as he grew older, he abandoned all such pursuits, and devoted himself exclusively to the sciences, especially those connected with electricity. At intervals between 1777 and 1782, he visited Switzerland, Tuscany, Germany, Holland, France, and England, making the acquaintance of the most eminent philosophers of these countries; and on his return is said to have introduced the culture of the potato into Lombardy. In 1796, he was one of a deputation sent to solicit the forbearance of Napoleon; and was received with distinction by the French general, who afterward invited him to Paris, to exhibit, to the members of the Institute, the action of the "pile" (see **GALVANISM**), which he had invented, enrolled him in the legion of honor, and conferred on him the order of the iron crown, with the titles of count and senator of the kingdom of Italy. He was also elected (1801) a foreign associate of the French institute, ten years after he had been made a fellow of the royal society of London. He died at Como, Mar. 5, 1826. Volta's contributions to the science of electricity are of great importance, the chief of them being his theory, in opposition to the "animal-electricity" doctrine of Galvani, that the electric power resides in the metals; although, in turn, he fell into the error of supposing that the chemical action of the different kinds of metal on each other was only incidental. He also invented an electric battery, consisting of a series of cups arranged in a circle, each cup containing a saline solution in which were immersed, edgewise, two plates, one of zinc and the other of silver, the zinc plate in one cup being connected with the silver one in the next by means of a wire. This battery was, however, soon after superseded by his "pile." He also invented, in 1775, the *Electrophorus* (q.v.); in 1782, the electrical *Condenser* (q.v.), employing with it an electrometer (see **ELECTRICITY**), in which two straws were employed instead of the gold-leaf strips now in use; and also (1777) the hydrogen-lamp, and the electrical pistol. Most of his important discoveries were communicated by him directly to the royal society in the form of Memoirs, which were published in the *Philosophical Transactions* (1782, 1783, 1800); and the Copley medal was awarded to him in 1794. — A collection of Volta's works was published in 1816 at Florence, under the title of *Collezione delle Opere*, etc., in 5 vols. 8vo.

VOLTAIRE (**FRANÇOIS-MARIE AROUET**, his true name)—one of the most famous of French writers—was b. according to his own accounts, as given in later life, on Feb. 20, 1694, at Chatenay, near Sceaux. The register of his baptism, however, assigns Paris as the place of his birth, and dates it Nov. 21 of that year. As to which of these statements may be really the correct one, his biographers are not yet fully agreed. His father was François Arouet, a notary of the Châtelet, ultimately treasurer of the chamber of accounts, his mother, Marguerite D'Aunmar, of a noble family of Poitou. Of two sons born to them, François was the younger. He received his education at the college of Louis le Grand in Paris; and on completion, he was set to study law by his father. But he found this pursuit too disgusting, and speedily quitted it for the career of a man of letters. By his godfather, the abbé de Châteauneuf, who was very intimate with her, he was introduced to the celebrated Ninon de l'Enclos, and through her to the best French society of the period. In these wicked and witty circles, being himself deficient in neither wickedness nor wit, the young man prospered extremely; and so perfectly unexceptionable was the company in which he found himself, that one day he could exclaim, looking round the table with complacency: "Are we all, then, either princes or poets?" His father, however, deeply disapproving of the life he led as immoral, and probably not inexpensive, had him sent to Holland with an embassy. Here he became involved in a love-affair of the more respectable kind, which ended, not in marriage, as he seems to have proposed, but in his being sent back to Paris, to resume his gay career. Shortly, it suffered another interruption: on suspicion (unfounded) of his being the author of some satirical verses, reflecting on the government of Louis XIV., then just dead, he was sent to the Bastille (May 17, 1717), where he remained upward of a year. This time of imprisonment he improved by sketching his famous poem, afterward published as the *Henriade*, and by finishing his tragedy, *Œdipe*, which was produced on Nov. 18, 1718, and had so great a success with the public, as not only to delight the author, but somewhat to mollify his old parent, who began to surmise

that the despised "poetry" of his offspring was not unlikely to come to something. The same success did not, however, attend his next ventures: his tragedy, *Artémire*, produced in 1720, was hissed off the stage; and his *Mariane*, which followed in 1724, fared but little better. Meantime he had again visited Holland, making, on the way, the acquaintance of Jean Baptiste Rousseau, a poet of some importance, then living at Brussels. The two geniuses met as friends, only to part as irreconcilable enemies. Their quarrel is said to have originated in a characteristic *mot* of Voltaire, who, his critical opinion being asked of the *Ode à la Postérité*, which Rousseau read to him, had the candor to reply thus: "Mon ami, voilà une lettre qui n'arrivera jamais à son adresse." In the summer of 1725 occurred a misadventure, which, for Voltaire, had important consequences. At the dinner-table of the duke de Sully, he resented with spirit an affront put upon him by the chevalier de Rohan, who, worsted in the war of wit, as most men were likely to find themselves with Voltaire, avenged himself some days after by having his adversary thrashed in public by footmen. Subjected to so gross an outrage, Voltaire retired for a time into private life, assiduously perfected himself in the small-sword exercise, and then courteously entreated the chevalier to a meeting in the *duello*. The chevalier, as it proved, had small stomach for the encounter; having immortalized himself sufficiently by his insult to the poet, he considered it unnecessary to aspire to the further immortality of being killed by him. Under superficial pretences of accepting the challenge, his practical answer to it came in the form of a *lettre de cachet*, which consigned Voltaire once more to the Bastille. His imprisonment was not on this occasion a long one; but it was only under sentence of exile that he was permitted to issue from durance; and on doing so, he betook himself to England. Some little time previous, the young Arouet had assumed the name of Voltaire, destined to become so famous. As to the origin of this name, considerable perplexity has existed; but there can scarce be a doubt of the correctness of the conjecture thrown out by Mr. Carlyle, in the second volume of his *Frederick*, that it is simply an anagram of Arouet *l. j.* (*le jeune*).

Arriving in England in 1726, Voltaire remained there upward of two years. Of this episode of his life, we have only the most meager account. It is certain, in a general way, that he had the *entrée* to the best English society; he knew Bolingbroke, Pope, and we need not doubt, many others of the intellectually distinguished. Of his visit to the famous Mr. Congreve, and the little skirmish of wit between them, we have express record. It was a whim of Congreve to affect dislike of his fame as an author, as to a certain extent a disparagement of his claims as a person of quality. On his signifying to Voltaire that it was simply as this last he desired that his friends should regard him, he was answered to the effect, that had he been nothing more than the elegant gentleman he considered himself, M. de Voltaire would scarce have thought it worth while to solicit the honor of his acquaintance. To Voltaire, his residence in England was fruitful of new knowledge and ideas; in the school of the English deists, Bolingbroke, Collins, Tindal, Wollaston, etc., he found speculations much to his mind; the philosophies of Newton and Locke he studied diligently; and in his subsequent dramas there may be traced a distinct influence from Shakespeare, whom, however, he has expressly vilified, as a barbarous monster of a writer, intolerable to any reader with the least tincture of orthodox French *goût* in him. Not the less the distinction remains with Voltaire of having been the first Frenchman to recognize in some decisive, if grudging and inadequate way, the essential superiority of our great national poet. The intellectual debt thus indicated was not the only one which Voltaire owed to England. While resident there, he published in a revised form his epic poem, the *Henriade*, a surreptitious edition of which had already appeared in France. The work was dedicated in English to queen Caroline; the subscription for it was headed by her and other members of the royal family; the rank and fashion of the country could not but follow the illustrious example set them; and for result Voltaire could convey into his pocket the comfortable sum (stated so high as £8,000), which became the basis of his future fortune. From the time of his return to Paris in 1728, he had always on hand some speculation: investments in corn, bacon, or whatever a pretty penny could be turned by, with now and then a fat army-contract, which a friend might have interest to secure for him; and so shrewd in his finance was he, that, owing but little to his books, which, despite of their immense popularity, were never a source of great profit to him, his income at his death is ascertained to have netted some £7,000 per annum, a revenue then to be styled princely. Of his literary labors, from this time forward unremitting, the sum of which remains in something like ninety volumes, no detailed account can here be attempted. His was truly a universal genius; he wrote literally everything—histories, dramas, poems, disquisitions, literary, philosophical, and scientific; novels, for the most part with some doctrinal purpose, of which his famous *Candide, or the Optimist*, may stand as the type; his literary correspondence was on an unexampled scale; and he was seldom without some fierce polemic on hand, in which his adversaries had to writhe for the amusement of the public, under the scourge of his envenomed wit.

In the gay society of Paris, he became acquainted with a certain Mme. du Châtelet, who was living apart from her husband, the marquis, though still on polite terms with him. She was *assez spirituelle*; a most fascinating woman of the world, and in the mat-

ter of intellectual accomplishment, the bluest wonder of the period; most especially she was deep in mathematics, and had mastered the mysteries of Newton's *Principia*. As himself an admirer of Newton, Voltaire could not but be charmed to meet him thus surprisingly put into petticoats; nor could a woman so intellectual as madame fail, in her turn, to appreciate the tender attentions of such a genius as M. de Voltaire. Their intimacy became extreme; and finally, in 1733—the husband of the lady behaving like a philosopher and man of fashion of the time, and continuing now and then to visit them—they went off to prosecute it undisturbed at Cirey, an old château in Champagne, the property of M. du Châtelet. Here, for the most part, they diligently studied Newton together for the next fifteen years. The arrangement seems to have been on the whole a not unhappy one; but toward the close it became complicated for M. de Voltaire by the advent of another lover, in the person of a Monsieur de Saint-Lambert. It is not conjectured that this gentleman knew anything of Newton, or was at all such a genius as Voltaire; but it is certain that, on some other ground unexplained, he found favor with Mme. du Châtelet. The philosophy which the husband had been good enough to practice in favor of Voltaire was now required of himself; and after a little unpleasantness he was able to reconcile himself to the inevitable. This curious triangular love-affair—on *square*, if we include the husband—was not, however, of very long duration. In 1748 Mme. du Châtelet died in child-bed. Voltaire was overcome with grief; and the touching reproach which, in the first agony of bereavement, he addressed to the culpable M. de Saint-Lambert, a fortunate chance has preserved for us: “*Eh! mon Dieu! Monsieur, de quoi vous avisez vous de lui faire un enfant.*” This, which is now so shocking, illustrates strikingly the morals of a period in which it seemed entirely *comme il faut*.

To dissipate the sense of loneliness which overpowered him in the loss of his “divine Emilie,” as he was wont, in his more lyrical moments, to call her, Voltaire once more betook himself to Paris, whence, in 1750, he proceeded to Berlin, on the invitation of the young king of Prussia, Frederick, since known as “the great.” Between him and Voltaire much correspondence had already passed; and they seem to have entertained for each other a sincere admiration and regard. When they came together, however, it was found, as so often in such cases before and since, that it is not in the matter of mountains only that “distance lends enchantment to the view.” They quarreled bitterly, and parted; Voltaire, at his exit from the country, being subjected to indignities which he found it hard to forgive. Into the details of the quarrel we need not enter. When we say that the king was a poet at once most profuse and most execrable; and that the main function of Voltaire—himself a poet—was to criticise and correct his verses, it should almost seem that we indicate, without going further, a sufficient *origo mali*. Voltaire detested the king's verses; the king could hardly have been even the very bad poet he was, without heartily detesting Voltaire's criticism and corrections. Is it marvelous that in no long time they got heartily to detest each other? A reconciliation was afterward effected, and their literary correspondence was resumed under the old forms of friendliness; but meantime Voltaire had avenged himself in the amusing but most scandalous chronicle, entitled *Vie Privée du Roi de Prusse*, which was found at his death among his papers, and published, as there is pretty good reason to suppose the wicked wit meant it should be.

After some years of a somewhat unsettled kind, Voltaire, in 1758, established himself along with his niece, Mme. Denis, at Ferney in Switzerland, where, with little exception, the last 20 years of his life were passed. During this period some generous traits of character are recorded of him. Thus, he rescued from extreme want a grandniece of Corneille the great dramatist, had her carefully educated under his own eye at Ferney, and made over to her the proceeds of an annotated edition of her ancestor's works, which he issued for her express benefit. His noble exertions in behalf of the Calas family, the victims of a shameful persecution, are also well known. In 1778 he was induced by his niece to revisit Paris. By the Parisians the poet, now in his 84th year, was received with a perfect tumult of enthusiasm, the excitement connected with which is thought to have hastened his death, which took place on May 30 of that year.

With the doubtful exception of Rousseau (Jean Jacques), who in his character of *vates* and enthusiast, was perhaps even more deeply influential, Voltaire is by far the most memorable of the band of celebrated writers whose crusade against established opinions was preparing the grand *culbute* of the French revolution. As every one knows, it was mainly in the field of religious polemic that his destructive energies were exerted. It is common to stigmatize him as an atheist, but this is simply to exhibit ignorance. Discarding revelation, he steadily upheld the truths of natural religion, and was, in fact, a deist pretty much of the English type. As such, he was not a little despised by the more “advanced” minds of the period, Diderot and the like, who considered belief in a God clear evidence of intellectual infirmity. His favorite weapon was ridicule, and there was never, perhaps, a greater master of it. In a particular form of polished mockery, Voltaire remains almost without a rival. His prose is the perfection of French style; it is admirable in grace, clearness, vivacity, and alive like a sparkling wine with the particular quality of *esprit* peculiar to the people and the language. As a dramatist Voltaire takes rank as a worthy third with his two great prede-

cessors of Corneille and Racine. His most famous poems are the *Henriade*, before mentioned, the one epic of the language, and *La Pucelle*, which is, perhaps, more properly to be styled infamous, such is the profanity and indecency with which the writer has willfully defiled the heroic story of the maid of Orleans. In the historical works of Voltaire, with the utmost lucidity of method, there are traces of a more philosophical treatment than had previously been applied to such subjects. For its narrative charm, his little historiette, *Charles Douze*, familiar to every school-boy, is in its kind a perfect model. In English, biographical works on Voltaire are very few in number. Of his earlier life, a most racy and amusing sketch will be found in the second volume of Mr. Carlyle's *Frederick the Great*; and his relations with Frederick are of course in that work treated of in full, with the writer's characteristic humor and insight. As a critical estimate at once of the man and of the writer, nothing better can anywhere be found than Mr. Carlyle's earlier essay.

In 1866 the first volume of a *Life and Times of François-Marie Arouet, calling himself Voltaire*, by Francis Espinasse, was published by Chapman and Hall; but this work, which promised to ably supply a desideratum, has been left unfinished. See also *Voltaire*, by David Friedrich Strauss (1870); *Voltaire*, by John Morley (London, 1872); and *Voltaire et la Société du XVIII^e Siècle*, by T. G. Desnoiresterres (8 vols. 1855-76).

VOLTERRA, a t. of central Italy, in the province of Pisa, stands on a table-land at the height of nearly 2,000 ft. above sea-level, 30 m. s.e. of Leghorn. It is surrounded by cyclopean walls, which are in a better state of preservation than any structures of the same kind in Italy. The gate called *l'Arco*, and the remains of baths and of an amphitheater, are interesting vestiges of antiquity; the cathedral, municipal palace, and *pretorio*, are monuments of the middle ages; and the *mastio*, a prison is a modern edifice. Volterra contains a college, numerous schools, and a library of 120,000 volumes. Wine, oil, corn, and mulberry trees are grown in the lands belonging to the town, which also possesses considerable mineral wealth. Pop. 6,000.

Volterra, the ancient *Volaterræ*, was one of the most powerful and important of all the Etruscan cities, and came into the possession of Rome 474 B.C.; after the fall of the empire, it suffered much from the invasion of barbarians.

VOLTERRA, DANIELE DA, 1509-66, b. Tuscany, studied art in Volterra, Siena, and Rome. In the frescoing of the Vatican he assisted Del Vaga, his former teacher, was an associate of Michael Angelo and was nick-named the "breeches maker" for having clothed some of the latter's nude figures in the "Last Judgment" by order of Paul IV. His best works were the "Descent from the Cross," in the church of Trinita de' Monti, and the "Massacre of the Innocents," in Florence.

VOLTIGEURS, picked companies of irregular riflemen in the French regiments. They are selected for courage, great activity, and small stature. It is their privilege to lead the attack.

VOLTI SUBITO (Ital. turn quickly), in music, an indication placed at the foot of a page, to signify that the page ought to be turned without delay.

VOLTRI, a t. of northern Italy, in the province of Genoa, and $9\frac{1}{2}$ m. w. of the city of that name, on the gulf of Genoa. Its churches are richly adorned; it contains many fine villas, and manufactures paper extensively. Near it are the sulphureous springs and baths of Aqua Santa, very efficacious in cases of cutaneous disease. Pop. 6,000.

VOLTUMNA, the goddess of the Etruscan confederation. The deputies from the 12 divisions met at her temple, whose site is uncertain, and is placed by some at Monte Fiascone, and by others at Viterbo.

VOLTURNO, a river in s. Italy, rising in Monte San Croce, flowing s.e., and w., and emptying after a course of about 100 m. into the gulf of Gaëta. It is the ancient Volturnus. Garibaldi fought the Neapolitan royal army on its banks in the autumn of 1866.

VOLUMETRIC ANALYSIS, in chemistry, consists in submitting the substance to be estimated to certain characteristic reactions, the chemist employing for such reactions liquids of known strength, and from the quantity of liquid employed to induce the reaction, determining the weight of the substance to be estimated by means of the laws of equivalence. The idea of this method first suggested itself to Gay-Lussac in considering how most readily to determine the amount of silver in an alloy of that metal and copper; but the method itself did not come into general use till within the last 30 years. The liquid reagents of known strength are called *standard solutions*; and the amount employed may be estimated either by weight or by volume, but the latter being the easiest of application, is universally employed; and hence this method of analysis, based on the use of standard solutions, is called *volumetric analysis*. In order that a reaction may be applicable in volumetric analysis it must satisfy the two following conditions, (1) It must not occupy much time; and (2) the termination of the reaction must be

easily recognized and unmistakable to the

eye. The necessity that these conditions should be fulfilled, very much limits the number of volumetric processes. In addition to the ordinary chemical apparatus, this kind of analysis requires graduated glass vessels of different kinds for the measurement of the standard solutions. Of these, the most essential are: (1) *Pipettes*, which are glass vessels of the form of figs. 1 and 2, intended for the delivery of the standard solution. Fig. 1 is provided with a single mark upon the neck, while fig. 2 is divided and graduated through its whole length, the division being always made into cubic centimeters (c. c.), according to French scale; (2) *Flasks* graduated for the contents in various sizes from one-tenth of a liter to five liters, and used for the preparation of standard solutions; (3) *Burettes*, or graduated tubes for measuring the liquids used in an analysis. The burette was invented by Gay-Lussac; but since his time, various modifications have been proposed, the best of which, for general purposes, is that which is known as Mohr's burette. It is shown in fig. 3; and its lower part is attached to an india-rubber tube and spring-clamp or clip (*quetsch-hahn*). Its principal advantages over other forms of the instrument are, that its constant upright position enables the operator at once to read off the number of degrees of standard (or test) solution used for any analysis, while the quantity of fluid to be delivered can be most accurately regulated by the pressure of the thumb and finger on the clamp; moreover, as it is not held in the hand, no error is likely to arise in the measurement from the heat of the operator's hand. The greatest drawback to it is

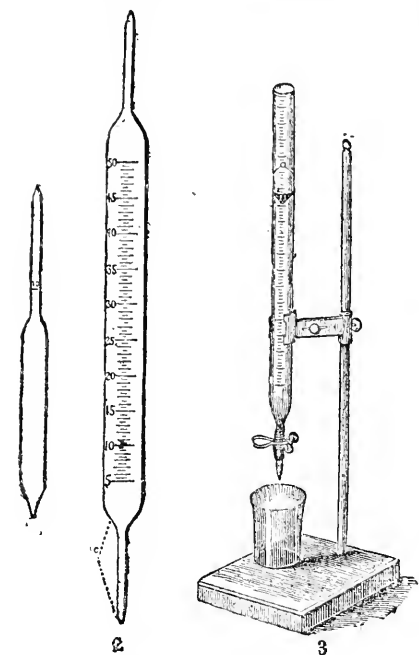


FIG. 1.—A pipette, containing 10 c. c.

FIG. 2.—A pipette, containing 50 c. c., divided through its whole length in c. c.; being thus graduated for measuring the delivery of fluids.

FIG. 3.—a, the india-rubber; b, the slips made of brass wire, by which the india-rubber tube can be closed at will.

that it cannot be used for those test solutions which decompose india-rubber.

The *standard solutions*, known also as *test* or *titrated solutions* (from the French word *titre*, which signifies the standard of a coin), may be divided into (1) such as are immediately prepared by weighing a substance of known composition, dissolving it, and diluting it to the required volume; and (2) such as are prepared by approximate mixture and subsequent exact analysis. The preparation of the first kind requires no description; for the preparation of the second kind, we must refer to the article ANALYSIS, VOLUMETRIC, in Watt's *Dictionary of Chemistry*, vol. 1. p. 259, where the method is fully explained, and as an example, the preparation of a standard solution of sulphuric acid containing *t* grammes of hydrated sulphuric acid in 1 liter is given. It is obviously essential that the greatest care must be taken both with respect to the graduation of the measuring instruments and the strength and purity of the standard solutions, which must be protected from evaporation and other hurtful influences by being kept in bottles of 1 or 2 liters' capacity, provided with well-ground stoppers.

Volumetric methods are usually classified as follows, according to the principles on which they are based—(1) *Analysis by saturation*, when the quantity of a base or an acid is measured by the quantity of acid or base which is required for exact saturation—a point to be determined by test-papers, tincture of litmus, etc. (2) *Analysis by oxidation and reduction*, when the quantity of the substance to be determined is found by the quantity of chlorine, bromine, iodine, or oxygen to which it is equivalent (regarded as oxidant), or by the quantity of chlorine, bromine, iodine, or oxygen which it requires to pass from a lower to a higher stage of oxidation. The chief oxidizing agents are permanganate of potash and bichromate of potash; while the reducing agents chiefly used are protoxide of iron and hyposulphite of soda. (3) *Analysis by precipitation*, when the determination of a substance is effected by precipitating it in some insoluble and definite combination. Our limited space does not admit of our giving an example of more than one of these forms of analysis, and from its historic interest we shall select the last, in its application to the determination of silver. We shall borrow Mr. Sutton's account of this process. "Suppose," he observes, "that it is desirable to know the quantity of pure silver contained in a shilling. The coin is first dissolved in nitric acid, by which means a bluish solution containing silver, copper, and probably other metals, is obtained. It is a known fact that chlorine combines with silver in the presence of other metals to

form chloride of silver, which is insoluble in nitric acid. The proportions in which the combination takes place are 35.5 of chlorine to every 108 of silver; consequently, if a standard solution of pure chloride of sodium is prepared by dissolving 58.5 grains of the salt—i.e., 1 eq. sodium (= 23) plus 1 eq. chlorine (= 35.5) or 1 eq. chloride of sodium—in so much distilled water as will exactly make up 1000 grains by measure, every single grain of this solution will combine with 0.0108 of a grain of pure silver to form chloride of silver, which precipitates to the bottom of the vessel in which the mixture is made. In the process of adding the salt solution to the silver, drop by drop, a point is at last reached when the precipitate ceases to form. Here the process must stop. On looking carefully at the graduated vessel from which the standard solution has been used, the operator sees at once the number of grains that have been necessary to produce the complete decomposition. For example, suppose the quantity used was 520 grains; all that is necessary to be done is to multiply 0.0108 grains by 520, which shows the amount of pure silver present to be 56.16 grains." By volumetric as compared with ordinary analysis, a large amount of time, labor, and therefore of expense, is saved; at the loss, however, often of due accuracy, unless the greatest care be taken that the standard solutions are of due strength, and the instruments accurately graduated. An analysis can thus be completed in a quarter of an hour that would formerly have occupied a day or more. Independently of its application to pure chemistry, it facilitates to a great extent the chemical analysis of urine (on which subject see the English translation of Neubauer and Vogel *On the Urine*, published by the New Syd. Soc.), of waters (on which see Parkes *On Hygiene*), of manures, soils, etc.; and its processes have been freely introduced in the British Pharmacopœia. The standard book on this subject is that of Mohr, a German chemist; the English reader may consult the text-books of Scott of Dublin, and Sutton of Norwich, and various memoirs in the *Chemical News*.

VOLUNTARY CONVEYANCE is, in bankruptcy and other proceedings, a conveyance which is made without any legal consideration, either of money or of marriage; and in competition with creditors having deeds made for consideration, is often deemed fraudulent, and is generally postponed or set aside altogether.

VOLUNTARY CONVEYANCE (*ante*), the transfer of an estate in real property or of goods and chattels, without the receiving of any adequate valuable consideration. By an early statute, 27 Eliz. c. 4, there is a presumption of fraud in cases of voluntary conveyance, but this may be repelled by evidence that there was reciprocity of benefits, and that the transaction was *bona fide* and not intended to deceive a subsequent purchaser. The statute alluded to, from its date, forms part of the common law of the United States, and has not been materially altered by state laws. It is held that such a conveyance is good as between the parties to it; and a distinction is made between prior and subsequent creditors, the former deriving no benefit from the statute. As to goods and chattels, the law was established by 3 Henry VII. and 13 Eliz. c. 5, which declare such conveyances, if made with intent to delay, hinder, and defraud creditors, void as against the person to whom such frauds would be prejudicial.

VOLUNTARIYISM, the principles or system of polity distinctive of those who advocate the separation of church and state; the cessation of state endowments and state grants for religious purposes, and, in general, of all interference, patronage, or exercise of authority on the part of the civil power in the religious and ecclesiastical affairs of the subject. The terms Voluntaryism and Voluntary have been in use since the date of the keen discussions regarding civil establishments of religion—commonly called the "Voluntary controversy"—which sprung up in the second decade of this century between churchmen and dissenters, in Scotland; and they serve to suggest, not inappositely, the fundamental conception which underlies the creed of religious dissent, that all true worship, or acceptable service in religion, must be the free expression of individual minds, and that, therefore, religion ought to be left by civil society to mold itself spontaneously according to its own institutions and spiritual nature, without violence to individual freedom from any interposition of secular authority or compulsory influence. Voluntaryism seeks to define more accurately the limits of civil power by defining more adequately than preceding theories had done the latitude due to the movements of religion. Assigning the magistrate his proper sphere, it is equally careful to assign the church and the individual their appropriate spheres of responsibility and duty in reference to religion, within which they may work unchecked, in full harmony with all the claims of civil order. Voluntaryism may be regarded as the formula of advanced Protestantism, the corrected doctrine of church and state, which the failure of the experiment of national churches has forced on public thought. It is a protest in modern language against the encroachment of the temporal power, whether under the name of magistrate, nation, or political majority, on the rights and liberties of individual conscience. Voluntaryism has sometimes been erroneously considered the offspring of theological neutrality. On the contrary, its leading advocates base it on the expressed law of Christ respecting the constitution, administration, support, and extension of the church, as well as on the rights of conscience, the nature of civil government, and considerations of general equity and policy. In its most extensive sense, Voluntaryism embraces the whole question of the province of the magistrate in reference to religion and the church. Voluntaries admit that magistrates as well as other men, being under law to God, ought

so to execute the proper duties of their office that all shall be done in consistency with the paramount claims of morality and religion. At the same time, the nature and design of civil government excludes their authority from the domain of religion and conscience, and confines it to the secular concerns of individuals and of society. Magistrates, like other men, are under obligation to seek and to follow the highest available light and guidance in duty; but it is not therefore allowed them to convert the rules of the Divine Word, which are addressed exclusively to the individual conscience, into laws for civil society. God alone being lord of the conscience, such laws only—though revealed in his Word—may be adopted and enforced in civil society as are requisite for its outward preservation, peace, and good order, and for the advancement of those secular interests which are the proper care of its rulers. While, therefore, magistrates, no less than other men—and for reasons common to all favored with the Gospel ought, as individuals, to embrace and profess the Christian religion, and to employ wisely and justly the influence arising from their circumstances and station, it is no part of their political or official duty, or of the homage required of them by Christ, to emit, adopt, prescribe, or enforce a confession of faith; neither is it within their province to aim at establishing or propagating Christianity by the civil arm, to provide for, endow, or subsidize its teachers either in churches or schools; but it is their duty impartially to protect all their subjects, of whatever creed, in the enjoyment of full religious liberty, so long as their manner of exercising this civil right does not infringe on the equal rights of others. On this ground, and with such qualification, it is their duty to abstain from all interference with the jurisdiction and economy of the church—not excepting the matter of its support—which being regulated, as Voluntaries believe, by special ordinances of Jesus Christ, its head, it is an invasion of his prerogatives, and a frustration of his law for its support and extension, to place, or suffer to be placed, on the footing of a civil establishment. The doctrine regarding the support of religion has always been an important article in the Voluntary creed, and, in a restricted sense, Voluntaryism has been popularly defined by this doctrine. Negatively, the duty of providing for the support of Christian institutions does not lie with the magistrate or nation. The giving of property for the support of the gospel has been elevated by Voluntaryism from the position of an almost eleemosynary and political custom, to the rank of a systematic obligation and a financial law of the church. It is recognized as an act of religion, the duty and privilege of all Christians; and as each man is a steward of his silver or gold, responsible to none but its great owner for his disposal of it in religious matters, the magistrate can possess no right to demand from him any portion for religious uses, or to apply to these uses the proceeds of taxation imposed for general ends. Civil society being promiscuous and variable in its constituents, a fixed arrangement for the endowment of religious bodies out of the public funds is a fixed usurpation—as a system of occasional grants is an occasional usurpation—upon the liberty and property of all who dissent. The existence of an absolute unanimity among the subjects—even were it possible, as it would be otherwise, to ascertain and secure it from time to time—however it might remove for the moment from any minds the feeling of political grievance incident to such arrangements, could neither justify them as a policy, nor alter their character as an interference with religion in its economies. In its broad aspect, as an overstepping of the sphere of magistracy, all who restrict the magistrate, on whatever specific grounds, to secular affairs, must deem such interference objectionable; and Christian Voluntaries would reasonably ask, why legal machinery should be employed to gather the offerings which, in the state of public sentiment supposed, must be flowing unforced through their natural channels? and in particular, whether, if Christ has not appointed the magistrate to “tithe and toll” for his church, society can presume to assign him a work beyond his province? There is a manifest division of duties dictated alike by reason and revelation; and Voluntaryism claims the results of experience as proof of the entire want of adaptation in the compulsory or magisterial power to deal with the support of a living religion. To burden the rent-roll, increase the assessments, distrain the goods and chattels of citizens, or even to preserve the forms of legal exaction for such a purpose, are measures which it is hard to believe either politic, scriptural, or just. The pecuniary supplies required for religious objects are to be secured, according to Voluntaryism, solely through the operation of moral influences and sacred motives. Truth, as well as error, must be left to provide for itself. The responsibility and privilege of providing for the support of Christianity having been attached by Christ to his church, it is further his law that its institutions shall be maintained and extended by the voluntary liberality of its friends. A primary obligation rests on those enjoying the services of a pastor to provide according to their ability for his maintenance, on the apostolic principle—“let him that is taught in the word communicate to him that teacheth in all good things;” while, on the equally apostolic principles, that the laborer is worthy of his hire, and that the strong should aid the weak, a mutual and collective responsibility remains with the general membership, to supply each other’s ecclesiastical necessities, and to unite in measures that may provide an adequate remuneration to the pastors or other ministers of the church. Civil establishments of religion, together with all forms of state endowments and grants for religious purposes, are thus condemned by Voluntaries as human expedients, adverse to Christian development and the working of the law of self-support, which alone draws forth the resources, and edu-

cates the consciences and habits of the people. Inadmissible, as introducing the compulsory element into the free and delicate movements of Christian society, and intruding magistracy into a sphere which the history of all struggles for the higher liberty teaches must be preserved to the individual and the church, these institutions tend to foster political dependence and class-feeling among the recipient bodies, and prevent those relations of honorable trust and responsibility which best unite pastors and people. These views express what may be called ecclesiastical Voluntarism. On the question of education, various shades of opinion exist among Voluntaries. All are agreed that the religious education of the young belongs to the parent and the church, and is not to be provided or superintended by the state. How to secure this principle in connection with a system of national schools or government grants for education, continues to be the problem of Voluntaries. Some seek the solution in a plan of local boards representing the parentage and community, who shall manage the schools, and decide the character of the teaching; and of these, some advocate separation of the hours for religious and secular lessons. Others, who think that while by these methods state superintendence may be avoided, state aid is yet directly or indirectly received for religious instruction, would accept a system which provided simply for schooling in secular or common branches. Those known as Voluntary educationists reject the idea of any national system, some on account of the religious difficulty, and others on grounds connected with the philosophy of education and the theory of government. Voluntary educationists would leave the education of the poor to be secured by the operation of those influences which originate and sustain other necessary and benevolent measures. The education of the children of classes not necessitous they expect to flow from private enterprise and free association. Voluntaries consistently object to grants to denominational schools dependent on the condition of teaching religion, to grants to ragged schools and all semi-religious institutions, as well as to the appointment and payment by the state of chaplains for prisons, the army, etc. In reference to the Sabbath, holding the sacred character of the day, some Voluntaries appear to admit that the magistrate is both entitled and bound not only to make it a *des non* in his own department, but also to prohibit labor and amusements throughout the nation. Others, equally holding the morality of the day, with more regard to strict theory, deny him the power of inflicting pains and penalties, however mild, in a matter radically religious, at the same time that they assert the obligation of the state to secure all its members due protection and facility in the practice of their worship, and to make such laws for this end as may be fit, in view of prevailing religious observances. Regarding national fasts and thanksgivings, most Voluntaries hold that the style of authority in which royal proclamations appointing these have usually been expressed is objectionable, as assuming a right to prescribe the topics and language of devotion, and to regulate its seasons, and insist that the language of invitation should be substituted for that of command. Some, while ready to comply with an invitation of the sovereign to join in an offering of prayer on occasions they judge suitable, do not allow that it forms any part of magisterial duty to issue such appeals, or that the royal act imparts a national character to the service. Ordinary political acts become national when done by the proper national organs; but no religious acts can acquire a national character except they are participated by the body of the people. When this is the case, the exercise is national, though not evoked by the call of the chief of the state, and it is not made more national by that call. The advantage of simultaneity and unity is attainable on the widest scale by the natural concert of churches apart from royal initiative, which, if it may be followed when right, need not be waited for as indispensable to true national worship. On the question of marriage, Voluntarism, recognizing its character as a civil transaction, demands that all religious parties stand on the same level in regard to it. Withholding legal sanction from all immoral connections, and punishing breaches of the lawful contract, magistrates are not warranted to visit with penalties any mere departure from the standard prescribed to Christian conscience, or embodied in ecclesiastical law. Political Voluntarism, as it is sometimes called, is simply Voluntarism expressed in the language of the politician—the doctrine of the entire religious equality of all citizens in the eye of law, stated and defended without reference to specific religious opinions, and in the way of appeal to principles generally received.

VOLUNTEERS—the great defensive citizen-force of Great Britain, in some degree corresponding to the national guard of continental states. It is essentially self-supporting, and wholly unpaid; although government arms the men, and contributes a certain sum toward the corporate expenditure. The oldest volunteer corps is the "honorable artillery company" of the city of London, which dates from the reign of Henry VII. although still called artillery, it comprises artillery, cavalry, and infantry, and is probably the oldest armed body in Europe. When the country was in dread of invasion by Bonaparte almost the whole available male population flew to arms as volunteers, and in 1803 they mustered 463,134 effectives. About this time George III. reviewed 150,000 volunteers. The force gradually diminished when the immediate danger ceased; and, before the war closed, they were replaced by a new force called the "local militia," which was supposed to be more thoroughly amenable to government control. As early as 1857 two small volunteer corps—the 1st Devon and the Victoria rifles—had sprung into existence.

but in 1859 the whole nation seemed to awake to a sense of insecurity, with a comparatively small army, half of which was abroad, amid the enormous armaments of neighboring states. In a few months 150,000 men had organized themselves into companies; and, in the following year, government, which had at first shown no favor to the movement, gave it a helping hand by combining the companies into battalions, by appointing paid adjutants and drill instructors, and by the establishment of a staff of inspectors under the control of an inspector-general of volunteers. The volunteers numbered in 1878-79, 182,810 efficient, in a high state of training, and capable of performing in a very satisfactory manner all the simpler military maneuvers. They are divided into a small number of light horse, mounted rifles, and engineers, a force of 33,409 artillery, and quite an army of about 147,902 riflemen. Where 60 men can be got together, a company of volunteers may be formed, which is entitled to a captain and two lieutenants or sub-lieutenants for its officers. If a place is populous enough, and sufficiently zealous in the cause to produce a corps of two companies, the senior officer becomes "captain-commandant." Four companies make a major's command; six are sufficient to constitute a battalion, for which government provides an adjutant, hitherto an old military officer, but now an army captain, who receives 10s. a day besides his forage. When there are a number of detached companies in the different villages of a district they are grouped into an administrative battalion (or brigade for detached batteries of artillery), with an adjutant, and with qualified field officers. England and Scotland are further divided into military districts, each commanded by a general officer, who commands and inspects all forces of whatever kind within his district, his constant endeavor being to keep the corps in his district up to the standard of efficiency. Every company may have an honorary assistant-surgeon; but a corps of two companies is entitled to an assistant surgeon; of four companies, to a surgeon, who may have an assistant when there are six companies, and two for eight or more companies. If a corps exceed a strength of twelve companies, it is customary to divide it into two battalions. The volunteer corps were originally raised under an act of 1804; but the circumstances of modern times having rendered various supplementary enactments necessary, the whole were embodied in a new act—the 26 and 27 Vict. cap. 65 (1863)—under which, and the "regulation of the forces act, 1871," and under orders in council issued from time to time the volunteer force of Great Britain is now constituted.

All officers are appointed by the crown, except sub-lieutenants, who are nominated by the lords-lieutenant of counties; the non-commissioned officers are appointed by the officers commanding. Adjutants and sergeant-instructors are at all times subject to the mutiny act—the other officers (and men) are subject to it only when their corps is embodied; but the queen can at any time deprive them of their commissions. Offenses within corps, in time of peace, are punishable by fines or otherwise, as laid down in the rules of the several corps, which must have the approval of the secretary of state for war. Every volunteer on joining must take the oath of allegiance, and must be of the age of 17.

The force may not be used in times of civil disturbance, but may be embodied for active service anywhere in Great Britain whenever the country is invaded, or invasion is apprehended by the crown. The occasion must first be communicated to parliament; or, if parliament be not sitting, to the country, by an order in council, and then the crown may direct the general commanding in districts to call out any or all of the volunteer corps in their respective commands for active service. Corps so called out come under the mutiny act, and are bound to march whithersoever the general may command. While embodied, officers and men are entitled to the same pay as in the regular army. In point of precedence, volunteers rank with, but after, the same ranks in the army and militia. The yeomanry are reckoned as part of the volunteers. Among themselves, the volunteers rank in the following order: 1st, light horse; 2d, artillery; 3d, engineers; 4th, engineers and railway transport corps; 5th, mounted rifles; 6th, rifles.

Members of a corps are honorary and enrolled. The first are merely subscribers of a certain amount; they are entitled to wear the uniform, but perform no duties. The enrolled members are the actual rank and file; they are classed as "efficient" and "non-efficient"—the efficient being those who are certified by the commanding-officer and the adjutant to have a competent knowledge of the duties of the service, and to have attended the following number of drills:

ARMY.	For Recruits during a period not exceeding Eighteen Months preceding the date of the Annual Return.	For others during each Twelve Months.
Light Horse.....	19 squad or troop drills.	9 troop drills, 3 of which have been drills of the whole corps.
Artillery Volunteers	30 drills, of which 24 are gun-drills.	12 gun-drills.
Engineers.....	12 engineering and 24 other drills.	6 engineering and 9 other drills.
Mounted Rifles.....	19 drills.	9 drills, of which 3 of the whole corps.
Rifle Corps.....	30 drills.	9 drills, of which 3 at least battalion drills.

The assistance afforded by the government to volunteer corps consists in the supply of adjutants; and of sergeant-instructors in the proportion of 1 to a corps of 3 companies or less, 2 from 4 to 7 companies, 3 up to 12 companies, etc. The money aid is a *capitulation grant* of 30s. annually for each volunteer who is efficient, including officers, in addition to which there is a special grant of £2 10s. for each officer and volunteer sergeant who holds a certificate of proficiency (for which a severe examination has now to be passed). In scattered administrative battalions, a charge of 5s. for each efficient is allowed to cover the cost of attending battalion drills. These allowances are, however, none of them personal, but are granted to corps, to be expended by the adjutant, who is accountable to the war office, within certain limits, according to the discretion of the commanding officer. Government likewise provides all the arms, and a certain quantity of practice-ammunition. At first the several corps were allowed to choose their own uniform, subject to the approval of the lord-lieut.; but there are now "sealed" patterns of uniforms; and new corps must be clothed accordingly, and old corps changing uniforms must conform. Volunteer corps do not bear colors. The system has not yet been extended to Ireland.—See MILITIA.

VOLUSIA, a co. in e. Florida, having the Atlantic ocean for its s. boundary, on the w. of the St. John's river; 2,100 sq.m.; pop. '80, 3,294—3,167 of American birth, 538 colored. Co. seat, Enterprise.

VOLUTE, in architecture, the spiral ornaments of the Ionic and Corinthian capitals, probably derived from Assyrian architecture, in which it is also used.

VOLU TIDE, a family of gasteropodous mollusks, of the section *pectinibranchiata*, all marine, having a spiral shell, which is turreted or convolute, the aperture notched in front, the *columnella* obliquely plated; no operculum. The animal has a very large foot, and a recurved siphon. The species are numerous, and abound chiefly in tropical seas. Many of them have very beautiful shells, much prized by shell-collectors. Several small species are found on the shores of Britain, of which *voluta tornatilis* is the only one that is not rare. This genus makes its appearance in the cretaceous strata, and increases in numbers in tertiary deposits, no less than 50 species being known in the pleistocene beds.

VOLVOX, a genus of minute organisms, the type of a family called *volvocinæ*, now regarded as vegetable, and ranked among *protophytes*, but which were at first supposed to be animals, and were reckoned by Ehrenberg among *infusoria*. They are globular, or nearly so, are found in stagnant water, and move slowly through the water, revolving round an axis, by the agency of numerous little filaments which project from green points on their surface. It was on account of their motions that they were formerly thought to be animalcules, and, partly on the same account, it has been suspected that they are not really protophytes, but *zoospores* of some kind of algæ. This opinion, however, is rendered improbable by their apparently possessing the power of reproduction: green granules being formed within the parent globe, at first adhering to its wall, and afterward becoming detached; the parent globe finally bursting to allow them to escape. These frequently exhibit, even while within the parent globe, a rotary motion similar to its own. The presence of starch in the interior of the *volvocinæ* has been detected by means of iodine, and is regarded as a conclusive proof of their vegetable nature. The most common and best-known species is *volvox globator*, which is just visible to the naked eye. It is a transparent sphere, having its surface studded with innumerable green spots, united by a beautiful net-work. From 6 to 20 young are often to be seen in its interior.

VOLVULUS (Lat. *volvere*, to twist) is the term used in medicine to signify a twisting of the intestine, producing obstruction to the passage of its contents. There are three distinct varieties of rotatory movement capable of giving rise to volvulus—(1) A portion of intestine may have become twisted on its own axis, and, in that case, even semi-rotation brings the intestinal walls into contact, so as to close the passage. This is a rare condition, and only occurs in the ascending colon. (2) The mesentery (q.v.), or a part of it, may be twisted into a cone, dragging the intestine with it; the mesentery being the axis, and the intestine being rolled up upon it. This form occurs in the small intestine. (3) A single portion or a coil of intestine may afford the axis round which another portion, with its mesentery, is thrown, so as to compress it, and close the passage. A coil of small intestine, the sigmoid flexure or the cæcum (see DIGESTION, ORGANS OF), may form the axis. All these varieties occur chiefly in advanced life, and their seat is commonly toward the posterior unyielding wall of the abdominal cavity, the smoothness and yielding nature of the parts anteriorly rendering such an event almost impossible. The *symptoms* of twisting of the intestines, especially of the sigmoid flexure, which is the most common seat of the affection, are usually very well marked from the beginning. Great pain is suddenly experienced in a small circumscribed spot of the abdomen, obstinate constipation usually setting in from that date. If the sigmoid flexure, which lies just above the rectum, is the seat of the twisting, the abdomen soon becomes distended, especially on the left side, the distention being much more marked than when the twist is in the small intestine, as might physiologically have been expected. Vomiting, often constant and copious, is usually present. These cases are so desperate in their nature

that it is needless to enlarge upon their treatment. Attempts to remove the displacement by injecting water or air into the intestine by means of a long tube have often been made, but with very slight success. Mr. Pollock, in his article on "Disease of the Alimentary Canal," in Holmes's *System of Surgery*, remarks that "relief in twist of the sigmoid flexure is just possible without opening the abdomen, provided the long tube be introduced into the distended gut, its contents drawn off, and the twist be reduced by the altered position of the bowel. But no operation for the ultimate relief of the patient will be successful unless the intestine be unloaded first, and the twist then reduced."—Vol. ii. p. 158. The operations that have been proposed for the relief of this and other intestinal obstructions are so often fatal, and, even when successful, leave the patient in so wretched a state, with an artificial outlet for the discharge of the contents of the bowels, that it is doubtful whether they should be recommended. It is simply a choice between almost certain death in a few days and a possible chance of a prolonged (but usually a miserable) existence. There are, however, a few rules that should be universally known and attended to—viz., wherever symptoms such as we have described occur, aperients should only be given by the rectum, while opium should be freely given by the mouth. Leeches and hot fomentations should be applied to the seat of pain; and all solid food should be prohibited, the nourishment being given solely in the fluid form.

VOMER, a bone which, in the human skeleton, forms part of the middle partition of the nose, and the lower edge of which fits into grooves between the apposed surfaces of the palatine processes of the upper jaw and palate-bones. It exhibits many modifications in the different classes of *vertebrata*. Its position is indicated in the figure of *archetype vertebrate skeleton*, in the article **SKELETON**. It is specially noticed here because of the frequent occurrence of the term vomer in articles on fishes—a very important character being often found in the presence or absence of teeth on the vomer; that is, along the middle line of the roof of the mouth.

VOMITING consists in the stomach emptying itself through the gullet and mouth. It is preceded by a feeling of nausea, a flow of saliva in the mouth, and the breaking out of perspiration; the countenance grows pale, a feeling of weakness spreads over the whole body, and the pulse becomes slow. At last the muscles of the abdomen and the diaphragm strongly contract, and the whole contents of the stomach are ejected with greater or less violence. The first matters to be ejected are the food and drink present, then mucus from the stomach and esophagus, and lastly, bile from the duodenum. In cases of disease, abnormal substances are sometimes vomited, such as blood, fragments of the intestines, and even excrementitious matters. When the vomiting is over it is followed by languor and drowsiness, or, if the excitement was inconsiderable, the usual state immediately returns.

The causes of vomiting are various. In the first stages of infancy it is almost normal, and occasions no disturbance of the system. In many animals, too, it is a normal function of life, as when birds of prey reject the hair and feathers of their victims. The infant gets rid of the superabundant milk it swallows by throwing it up with no trouble. Some persons can excite themselves to vomit by swallowing air.

The immediate causes of vomiting may be reduced, according to Dr. Carpenter, to the three following categories: "(1) The contact of irritating substances with the mucous membrane of the stomach itself; these, however, cannot act by *direct* stimulation upon more than its own muscular coat; and their operations upon the associated muscles must take place by *reflexion* through the nervous circle furnished by the pneumogastric and the motor nerves of expiration. (2) Irritations applied to other parts of the body, likewise operating by *simply-reflex* transmission; as in the vomiting which is consequent upon the strangulation of a hernia, or the passage of a renal calculus; or in that which is excited by the injection of tartar emetic or emetin into the circulating current, when these substances probably produce their characteristic effect by their operation on the nervous centers. (3) Impressions received through the *sensorial* centers, which may be either sensational or emotional, but which do not operate unless they are *felt*. In this mode seems to be excited the vomiting that is induced by tickling the fauces, which first gives rise to the sensation of nausea; as well as the vomiting consequent upon disgusting sights, odors, or tastes, and upon those peculiar internal sensations which are preliminary to sea-sickness. The *recollection* of these sensations, conjoined with the emotional state which they originally excited, may itself become an efficient cause of the action, at least in individuals of peculiarly irritable stomachs, or of highly sensitive nervous systems."—*Principles of Human Physiology*, 6th ed., p. 77.

According to the oldest doctrine respecting vomiting, it was held to arise solely from convulsive movements of the stomach, which was thought to take on a motion contrary to the usual peristaltic motion. Bayle advanced the opinion, that the stomach is quite passive in the operation, and that its contents are emptied entirely by its being compressed through the contractions of the abdominal muscles and the diaphragm. An apparently conclusive experiment of Magendie's, in which the stomach was removed, and a bladder substituted for it, had more recently (in 1813) satisfied most physiologists as to the passiveness of the stomach in vomiting, until Bécéard and Budge showed the insufficiency of his experiment. It is found, in fact, that in vomiting there are two *sets* of actions, viz. (1) contractions of the abdominal walls, while the diaphragm remains

fixed, and forms a support to the stomach, and (2) the stomach itself performs jerking movements, the pylorus, or inferior orifice, at the same time closing, while the cardiac sphincter relaxes, without which last-named action vomiting is impossible; and that either of the two kinds of movement—the abdominal or the stomachal—may eject the contents of the stomach into the gullet.

In the treatment of vomiting, we must consider it as a symptom rather than a malady. Where the stomach is irritated, relief is afforded according to circumstances, by drinking cold water, aerated or soda water, or, if necessary, by opium or nux vomica. Cold applications outwardly also do good. In other cases, infusions containing ethereal oils—camomile, coffee, etc.—astringents, or correctives for acidity—magnesia, soda, etc.—are the fitting remedies. When the irritation is in the brain, the best remedy is a horizontal position, with composure and darkness. If a person in sound health is suddenly seized with vomiting poisoning may be suspected.

VONDEL, JOOST VAN DEN (pr. *Yōst*), the greatest Dutch poet, was born at Cologne, Nov. 17, 1587, his parents, who were Anabaptists, having fled from Antwerp to avoid persecution. His maternal grandfather, Peter Kranen, ranked among the poets of Brabant. When freedom began to raise the head in Holland, the elder Vondel removed with his family to Utrecht, and afterward to Amsterdam, where he prospered in trade. The poet's education in boyhood was limited to reading and writing, but his perseverance and love of study enabled him in after-life to become intimately acquainted both with ancient and modern literature.

At the early age of 13, his poetical efforts were praised by Hooft. In his 23d year, he married Maria de Wolf, to whose clever management Vondel chiefly left his business as a hosier, while he devoted himself to study and poetry. The tragedies of Vondel are very numerous, and the grandest specimens of Dutch literature. His satirical writings and epigrams are full of fire, energy, and spirit. One of his most remarkable pieces is *Lucifer*, published in 1654, strikingly resembling Milton's *Paradise Lost*, which appeared thirteen years later. Vondel took an earnest and active part in favor of the Remonstrants, Grotius and Oldenbarneveld, drawing down on himself the anger both of the clergy and court, whom he attacked with the keenest satire.

Gysbrecht van Aemstel, *Adam in Banishment*, *Palamedes*, *The Batavian Brothers*, *Solomon*, *Samson*, *Adonijah*, *Noah*, or *the Destruction of the Old World*, *Mary Stuart*, etc. are splendid efforts of genius. *The Harpoon*, *The Horse-comb*, and *the Decretum Horribile* are stinging satires on the ruling powers both in church and state. Vondel's translations from the Greek and Roman writers are numerous, the *Metamorphoses* of Ovid having been rendered into Dutch verse when he was 84 years old. Vondel left no subject untouched, no measure untried. His works (9 vols, quarto) contain many sea-songs, and more than 100 odes. Many of the later poems were written with a strong Roman Catholic spirit, he having joined that church about 1640. Through the imprudences of his son, to whom he had given his business, Vondel fell into straitened circumstances, and in 1658 accepted a situation in the city pawnbroking office. In 1668, the magistrates allowed him to retire with his salary of 650 guilders yearly, which kept him above want. He was of moderate stature, well made, and had an eagle eye. After his powers of body and memory had begun to fail, he could still read without glasses. He died calmly on Feb. 5, 1679, at the age of 91, and was carried to his resting-place in the new church, Amsterdam, by fourteen poets, himself princeps poetarum.

VOORHEES, DANIEL W., b. Ind., 1828; graduated Asbury university, 1849; studied law and practiced in his native state. He became a democratic politician of influence, was U. S. district-attorney, 1858-61, and served as member of congress from 1861 to 1865, and from 1869 to 1871. In 1877 he was appointed U. S. senator to complete an unexpired term, and in 1879 was elected for a full term.

VOPADEVA is a celebrated grammarian of India. He wrote a grammar entitled *Mugdhabodha*, which is held in high repute, especially in Bengal, and was commented upon by *Durgadāsa*. (Both text and commentary have been edited at Calcutta in 1861; previous editions contain merely the text of Vopadeva's grammar.) It differs from the great work of Pāṇini (q.v.) in its arrangement as well as in its terminology; and without commentary of *Durgadāsa*, would not yield by far the information that may be derived from Pāṇini's grammar. It is valuable, however, on account of many later Sanskrit formations, that could not be contained in the older work. Vopadeva composed also a catalogue of Sanskrit *dhātus*, or so-called radicals, in verse, called *Kavikal-pādruma*, (published at Calcutta, 1848), and a commentary on it, the *Kāryakimodhenu*. Another grammatical work, the *Rāmāyākaraṇa*, is likewise attributed to his authorship. According to a general tradition prevalent in India, Vopadeva would also be the author of one of the most renowned Purāṇas (q.v.), the *Bhāgavata-Purāṇa*; and in a little treatise, the *Durjanamukha-chapeṭ'ika*, or "a slap on the face of the wicked," which is averse to this tradition, and maintains that Vyāsa (q.v.) was the author of this Purāṇa, three other works of a religious character are assigned to Vopadeva.—viz., the *Paramahansa-priya*, *Muktāphala*, and *Haritītī*. A little medical work, the *S'āśa-lokachandrikā*, though written by a Vopadeva (see prof. Aufrecht's *Catalogue of the Sanskrit MSS. of the Bodleian Library*), does not seem to belong to the author of the works just mentioned. The date of Vopadeva, given by some as the 12th, by others as the 13th c.

after Christ, is, according to Burnouf's investigation, the second half of the 13th century. —See E. Burnouf's preface to his edition, and French translation, of the first nine books of *Le Bhāgavata Purāṇa*, vol. i. (Paris, 1840).

VORANT, in heraldry, a term applied to an animal represented as swallowing another; as, sable, a dolphin naiant; vorant a fish proper.

VORARLBERG, a district of w. Austria, included in the Tyrol, but with a distinct government, diet and constitution; 1005 sq.m.; pop. 102,364. It is bounded by Bavaria on the n. and n.e., Grisons on the s., Liechtenstein and St. Gall on the w., and lake Constance on the n.w. It is traversed by the Arlberg mountains, from which it takes its name. It is drained by the Aach, Ill, Fussach, and Lech rivers. The soil is fertile, producing fruit, wine, cereals, and dairy products. Capital, Bregenz.

VORMEN, a river in Norway, 200 m. long, rising by many heads in the Langfield and Sagnefield mountains. It is 2,000 ft. above the level of the sea, and, flowing through the valley of the Gudsbrandsdale, expands into the lake of Mjösen. Above the lake it is called Laugen, from this point to the Glommer, 28 m. n.e. of Christiania, it bears the name of Vormen. The lake, 80 m. long and 8 m. broad, 600 ft. above the sea, is the center of a brisk trade, and the river through its entire length teems with salmon and salmon-trout.

VORONEJE, or **VORONETZ** (pronounced *Voronesh*), a government in the s. of Great Russia, bounded on the s. by Little Russia and South Russia. Area 25,712 sq.m.; pop. 70, 2,152,696, consisting of Russians and German colonists. It is watered by the Don, its two navigable tributaries, the Voroneje and Khoper, and other streams. The soil, mostly a black mold, is generally fertile, and great crops of grain—wheat, rye, barley, oats, and millet (which supply the inhabitants and local distilleries, and are exported)—are produced. Cattle and horses of a good breed are reared—the best studs belong to the crown. The principal manufactured articles are brandy, beer, cloth, beet-root, sugar, skins, wax-candles, soap, tobacco, and potash; and corn, tallow, hemp-seed, cattle, and horses are exported to Moscow, St. Petersburg, etc.

VORONEJE, a t. of Great Russia, capital of the government of the same name, stands on the right bank of the Voroneje, 150 m. s.w. of Tambov. It was founded in 1586 as a bulwark against Tartar invasion. Peter the great, who had previously visited the town, built a fortress and a dockyard here in 1694. Besides two cathedrals, the town has many important civil, ecclesiastical, and educational institutions. The commerce of Voroneje is extensive—the chief articles of trade being corn, hemp-seed, and tallow. Pop. '67, 41,592.

VORONTZOFF, **MIKHAIL**, 1782–1856; b. St. Petersburg; entered the Russian army and took part in the campaign against the Turks, and against Napoleon. He was appointed governor-general of South Russia and Bessarabia in 1823, and succeeded Menshikoff in 1828. He became governor of the Caucasus in 1844, conducted a campaign against Schamyl, and resigned from the army in 1854. In 1856 he was given the title of field marshal, and made governor of Odessa.

VÖRÖSMARTY, **MIHÁLY**, 1800–56; b. Hungary; studied law in Pesth, but devoted himself to literature. Of his epic poems, *Zalán Futása* and *Eger*, and of his dramas, *King Solomon* and *Kont*, are the best. His patriotic song, *Szózat*, was immensely popular in the revolution of 1848. At the time of his death he was engaged in translating Shakespeare into the Hungarian language.

VORSTIUS, **CONRAD**, 1569–1622; b. Cologne; studied at Heidelberg; appointed professor of divinity at the gymnasium of Steinfurt. From his published treatises, *De Predestinatione*, *De Sancta Trinitate*, and *De Persona et Officio Christi*, he was suspected of Socinianism, but made a satisfactory defense at Heidelberg; succeeded Arminius as professor of theology at Leyden, 1610; wrote a treatise, *De Deo*, which was burned by the hangman in London and Oxford; was deposed, 1612, and condemned by the synod of Dort as a heretic, 1619.

VORTEX (Lat. a whirlpool). Till lately, it was a reproach to hydrodynamics that the theory of vortices or eddies in fluids had not been properly brought under the domain of mathematical analysis. Even now, the problem has only been partially solved by the labors chiefly of Stokes (q.v.) and Helmholtz (q.v.), as their beautiful investigations apply only to perfect fluids, that is, fluids which oppose no frictional resistance to change of shape. In ordinary motions of perfect fluids, such as currents and waves, the instantaneous change of shape of a small spherical portion makes it an ellipsoid by simple extensions and compressions *without* rotation. The essential characteristic of vortex-motion is, that it involves rotation of some parts of the fluid. Helmholtz has shown that this rotational or vortex-motion remains with the parts of the fluid which first have it, and cannot be transferred. We can conceive no process by which vortex-motion could be given to, or taken from, a perfect fluid; for to our reason fluid friction (which does not exist in a perfect fluid) would seem to be indispensable. On such abstruse subjects we cannot of course enter here; but one result of Helmholtz's investigations is so curious that we must mention it. We are all familiar with those singular smoke-rings which are produced when a mortar is fired; or when, on a smaller scale, a bubble of phosphureted hydrogen takes fire in air, or a smoker skillfully emits a puff of tobacco-smoke. A

very simple mode of producing them, on even a large scale, is to bore a hole in one side of a box, remove the opposite side, and substitute a cloth or sheet of india rubber for it. A slight blow on this membrane ejects a vortex-ring from the hole. To make this vortex visible, we may burn phosphorus or moistened gunpowder in the box; or still better, sprinkle its interior with ammonia, and introduce a vessel containing common salt and sulphuric acid. The sal-ammoniac cloud which fills the box is admirably adapted to display the rings. Besides a progressive motion as a whole, the ring revolves about its own central or medial line. Suppose two such rings to follow each other, with their planes parallel, and their centers moving in the same line, Helmholtz shows that (at least in a perfect fluid) the foremost will relax its speed, and spread out into a larger ring, while its follower will contract, and quicken its pace, till it passes *through* the other, which in turn becomes the pursuer, and so on. This very curious result may be realized in a tea-cup, by drawing the half-immersed bowl of a tea-spoon along the surface of the tea for a short way, and withdrawing it. Two little whirlpools, or vortices, are then seen moving side by side. They are sections of the half vortex-ring which has been formed in the liquid by the spoon. A second half-ring may be at once sent after them by another stroke of the spoon, and the phenomenon above described will be obtained. When, on the contrary, two such vortex-rings *meet*, their centers moving in one line, they both spread out, and relax their speed indefinitely. This is obtained in a liquid by letting the half vortex-ring impinge directly on the side of the vessel, when it spreads out, and relaxes its speed; just as if there were no boundary of the fluid, but a second vortex-ring occupying the place of the image of the first which would be formed by a plane mirror substituted for the side of the vessel. When one vortex-ring impinges obliquely on another, it rebounds from it, and both are thrown into vibration, their form of equilibrium being circular. They act in fact in this respect like solid India rubber rings. By forming them from an elliptic aperture, they are produced in a state of vibration. A square aperture gives them in a different state of vibration.

The impossibility of producing or destroying vortex-rings in a perfect fluid—save by creative power—has led sir W. Thomson (q.v.) to regard the ultimate parts of matter as vortices of various kinds in a perfect fluid.

The word vortex has also come into use in connection with Descartes's once celebrated theory of the universe, given in his *Principia Philosophiæ*. In this the rotation of the planets about the sun, the satellites about the planets, etc., were explained (!) by the hypothesis of vortices forever whirling about the central body. Descartes was a good mathematician, but in natural philosophy he preferred metaphysics to experiment, and of course erred enormously. But he is not to be laughed at: mistakes more ridiculous than his are gravely propounded at the present day.

VORTICELLIDÆ, a family of *infusoria*, remarkable for beauty, and containing a great number of species, to which, from their form, the name of *bell* or *bell-flower animalcules* is often given. The genus *vorticella* consists of minute cup-shaped or bell-shaped creatures, each placed at the top of a long flexible stalk, the other end of which is attached to some object, as the stem or leaf of an aquatic plant. Around the edge of the bell or cup is a fringe of rather long cilia, the motion of which brings food to the mouth. The stem is flexible, and is sometimes stretched out to its full length, sometimes contracted in a spiral form. The contraction takes place instantaneously upon any alarm, the cilia at the same time vanishing; and it is very interesting to watch a group of *vorticellæ*, which may often be easily done with a Coddington lens, when they adhere to the inside of the glass of an aquarium. The stem is often beautifully branched, the *vorticella* becoming a compound animal, like many zoophytes, and the whole contracts or is extended at once. The stem, slender as it is, is a tube, through the whole length of which runs a minute muscular thread. A cup or bell of a *vorticella* sometimes develops a new fringe of cilia at its point of junction with the stem, becomes detached from the stem, and begins to move freely through the water, till it finds a new place on which to fix itself, reproduction thus taking place by gemmation. Reproduction also takes place by encapsulation. See *INFUSORIA*. To the family vorticellidæ belongs the genus *stentor*, having a trumpet-shaped body, and therefore receiving the popular name of trumpet animalcules. They swim freely through the water, at the same time rotating on an axis, and attach themselves to objects by a sucker at the lower or narrow end. They have a fringe of cilia round the mouth, and the body of some species is covered with cilia. They are very voracious. They may often be found adhering to a twig or the stem of an aquatic plant, collapsed into minute masses of green jelly.

VOSGES, a dep. in the n.e. of France, formed out of the s. part of the old province of Lorraine, is bounded on the n. by the departments of Meuse and Meurthe, and on the e. by Alsace-Lorraine. Area, 2,260 sq.m.; pop. 76,407,082. The surface is mountainous, the territory being traversed not only by the Vosges mountains, which run along its e. border, but also by the Faucilles mountains, which cross the dep. from e. to west. The chief rivers are the Moselle, and its tributaries the Meurthe, Madon, and Mortagne, all of which flow in a n. or n.w. course through this department. The mountains in the e. are covered with vast forests of beech and fir, and at the base of the mountains are tracts of pasture or rolling infertile plains. The w. part of the dep. called the *plaine*, is very fertile in cereals, vegetables, and fruits. Among the hills, the

climate is cold; on the plains it is humid. About 4,400,000 gallons of wine are produced annually. Mineral riches abound, there being iron, lead, copper, cobalt, and antimony mines. Of the kind of cheese called *Géromé*, 23,600 cwts. are made annually. The dep. is divided into the five arrondissements, Epinal, Mirecourt, Neufchâteau, Remiremont, Saint-Die. The capital is Epinal.

VOSGES MOUNTAINS (Lat. *Vogesus*, Ger. *Vogesen* or *Wasgau*), a range of mountains in the n.e. of France and the w. of Germany, run from s. to n., on the left bank of the Rhine, from the borders of the départements Haute-Saône and Doubs, n. to Mainz, and separate Alsace from the French départements of Vosges and Meurthe and the German Lorraine. The range runs parallel with the Schwarzwald or Black Forest in Baden and Württemberg, on the right bank of the Rhine, and forms the western border of this part of the Rhine basin. The summits are rounded and regular in outline, and are called *ballons*. The chief of them are the Ballon de Guebwiller, 4,600 ft.; le Hohenack, 4,429 ft.; and the Ballon d'Alsace, 4,101 feet. They are covered with forests, and abound in rock salt, silver, copper, lead, and coal.

VOSS, JOHANN HEINRICH, one of the foremost classical writers of Germany, was b. in 1751 at Sommersdorf in Mecklenburg, of poor parents. In 1772 he went to the university of Göttingen, and there joined the "Hainbund," an association of young poets, at the head of whom stood Bürger and Boje. Voss first intended to devote himself to theology, but soon exclusively turned to Greek and Roman antiquities, under Heyne's auspices. In 1778 he went from Wandsbeck, whither he had gone for the purpose of editing the *Musenalmannach*, to Otterdorf, in Hadeln, where he prepared his translation of the *Odyssey*. This appeared in 1781, and was received with universal applause. In the next year he became rector of Eutin, whence, in 1789, he issued his German translation of Virgil's *Georgics*. This was followed, in 1793, by a new and revised edition of the German *Odyssey* and *Iliad*, which, however, did not meet with as favorable a reception as the first. His contests with Heyne (q.v.) gave also rise chiefly to his *Mythological Letters*, which appeared in 1794. Among his purely German poetical works, *Luise*, an idyll (1783, revised 1795), takes a foremost place. In 1799 he issued the whole of Virgil in a German translation. In 1802 he went to Jena, where he wrote the celebrated review of Heyne's *Iliad*. In 1805 he was called to Heidelberg, where he wrote annotated German translations of Horace, Hesiod, Theocritus, Bion, Moschus, Tibullus, and Lygdamus. In 1821 he published a translation of Aristophanes, and a new edition of Horace and Virgil. Among other literary labors must also be mentioned his translation (with the aid of his two sons) of Shakespeare's works, which, however, is very inferior to Schlegel's. In opposition to Creuzer's *Symbolik*, he wrote an *Antisymbolik* (1824), in which he lifted up his voice against exaggerated praises of heathen mysticism; and one of his last papers was a violent denunciation of his former friend Stollberg, who had turned Roman Catholic. He died at Heidelberg in 1826. Among his translations from modern languages may be mentioned that from Galland's *Arabian Nights*, and that of Shaftesbury's works. A brief mention may also be made of his two sons: (1) HEINRICH, b. 1779, a philologist of merit, who assisted his father in his Shakespeare translation, and who was a great friend of Jean Paul's. He had intended to edit the latter's works, but died before him, in 1822. (2) ABRAHAM, b. in Eutin, professor of the gymnasium at Kreuznach, who completed the Shakespeare translation. He died in 1847.—See Paulus, *Lebensund Todeskünden von J. H. Voss* (Heidel. 1826).

VOSSIUS, GERARD, one of the most distinguished scholars of the first half of the 17th c., was b. of Dutch parents near Heidelberg, where his father was a Protestant minister. His father's name was John Voss, but he, after the fashion of the time, had Latinized it into Johannes Vossius, and hence his son called himself Gerardus Johannis Vossius, that is, Gerard, the son of John. In 1578 the family returned to Holland, and settled at Dordrecht, where Vossius went to school. He afterward distinguished himself at the university of Leyden; and when 22 he returned to Dordrecht, to become the principal of the school, of which he was the most distinguished pupil. He married shortly afterward, but his wife died in 1607, leaving a family of three children. In the same year, he again married, and by his second wife he had two sons and five daughters. In the earlier part of his life, Vossius does not appear to have published much, but he became known to his countrymen as a scholar and theologian; and his assiduity in study may be inferred from the fact that he would never allow a friend to stay with him more than a quarter of an hour. In 1614 he became principal of the theological college of Leyden, and while holding this appointment, published a work on Pelagianism (*Historia Pelagiana*). In it he spoke of the Arminians in an apologetic tone, and thereby brought down upon himself the wrath of a large section of the Dutch clergy; which caused him to be deprived of his office in the theological college, and of the income derived from it. His work had attracted attention in England, and it was some compensation to him that he received from archbishop Laud an office which brought him £100 a year without its being necessary he should live out of Holland. Chiefly, it appears, to secure the means of supporting his family, he retracted the opinions he had expressed, in his book *De Historicis Latinis*, published in 1627, and he became reconciled to the church. In 1633 he was appointed professor of History in a new university at Amsterdam, where he seems to have devoted himself to the completion of the great works on which his fame

rests. Among the most important of these not mentioned above were: *Aristarchus sive de Arte Grammatica, Libri VII.*; *De Historicis Græcis, Libri IV.*; *Commentariorum Rhetoricorum sive Oratoriarum Institutionum, Libri VI.*; *De Veterum Poetarum Temporibus, Libri II.* In 1649, Vossius was climbing the ladder of his library when it broke; he fell under the shelves and books, and died of the injuries he received.

The children of Vossius were remarkable for beauty, accomplishments, and learning. Grotius said of Vossius in epigrammatic Latin, that it was doubtful whether by his books or his children he had contributed most to adorn the age. Five of his sons, Denis, Francis, Gerard, Mathew, and Isaac, are known as authors.

VOSSIUS, ISAAC, a scholar and theologian, was the only son of Gerard Vossius who survived him. He was born at Leyden in 1618. When 21 he published an edition of the *Periplus* of Scylax, the Greek geographer, with a Latin translation and notes. He afterward traveled in Italy, collecting valuable manuscripts. In 1648 he took up his abode at the court of queen Christina of Sweden; but in 1658, in consequence of a quarrel with Salmاسius, he returned to Holland. In 1670 he came to England, and here, although he openly scoffed at religion, he was appointed by Charles II. a canon of Windsor, and had apartments assigned him in the Castle. He died there in 1688, and it is recorded that on his death-bed he refused to take the sacrament, until one of his colleagues argued that he ought to do so for the honor of the chapter. His works are numerous, but not so important as those of his father.

VOTERS, ABDUCTION OF, is an offense punishable by fine or imprisonment, and by a penalty of £50 besides, which may be sued for by an informer. The offense is included under the head of undue influence, and by the 17 and 18 Vic. 102, s. 5, is defined to be, the directly or indirectly making use of, or threatening to make use of, any force, violence, or restraint, in order to induce or compel such voter to refrain from voting at any election.

VOTIVE (Lat. *rotivus*, given in virtue of a vow; Fr. *rotum*, a vow), in ecclesiastical use, signifies the class of actions, offerings, or memorial records or observances, which are intended either as the fulfillment of a vow, or as a commemoration of the accomplishment of the prayer which accompanied the vow. Of such votive engagements there are numerous examples in the Old Testament (Lev. xxii. 18, Deut. xii. 6), as well as in the ancient religions of the Gentile world; and the ecclesiastical historian Theodoret (*De Cur. Græc. Affect.*, i. 8) alludes to the practice in his own day of hanging up, in the churches dedicated to the saints, little models of hands, feet, eyes, etc., in votive commemoration of the cure of lameness, blindness, and other maladies supposed to have been obtained through their intercession. The same practice continued throughout the succeeding centuries and throughout the mediæval period, and still prevails in Roman Catholic countries, especially in Italy and southern Germany. Votive offerings, often of very considerable value, may be seen in the churches of most of the great sanctuaries (q. v.), and in other churches in special repute as places of devotion. The offering very frequently takes the form of a votive tablet, with an inscription detailing the event on which it is founded. Sometimes the offering is simply marked with the words *ex voto*, "in fulfillment of vow;" sometimes it is accompanied by a model in wax, in wood-carving, or even in precious metals, similar to those alluded to by Theodoret; and occasionally by a model of some object, which is meant to recall the memory of the favor received, as of a ship, in case of escape from shipwreck, etc. Many of the great churches, hospitals, monasteries, and other religious monuments of the middle ages and of later times were built *ex voto*; and the treasures of most of the rich cathedrals and other churches abroad contain objects of great value, the result of votive engagements on the part of the donors. The name *rotive* is also applied in the Roman Catholic church to the mass or other service, when it is celebrated—as is permitted on certain days and in certain seasons—not according to the rite prescribed for the day itself, but according to a rite selected by the celebrant himself from a number of such "votive masses" and "votive offices," as "of the Passion," "of the Holy Trinity," "of the blessed Virgin Mary," etc., which are contained in the missal and breviary.

VOU-CHANG, or WOO-CHANG, a city of China, in the province of Hoo-pe, on the Yang-tse-Kiang, at the influx of the Han-Kiang, about 350 m. s.w. of Nankin. This is said to be one of the finest cities of China, famous for its learning and for its manufactures in metals. The pop. is stated at nearly 2,000,000.

VOUET, SIMON, 1590-1649; b. Paris, son of Laurent, a painter. He is called the founder of the French school of painting; studied with his father, and accompanied the French ambassador, baron de Sancy, to the Porte in 1611. After one interview only, he painted from memory an excellent likeness of the sultan Achmet I. Subsequently he visited Venice and Rome. At Rome he received a pension of 2,000 francs from Louis XIII. and became president of the academy of St. Luke; in 1627 principal painter to the king with apartments in the Louvre, employing Le Brun, Le Sueur, Mignard, Du Fresnoy, and others to assist him in painting ceilings, galleries, altar-pieces, small religious pieces, and portraits in oil and crayon. He is said by French historians of art to have done as much for painting as Camille did for the drama, in France. There are about 200 prints of his works, including the chapel and gallery of the Palais Royal, the altar-

pieces in St. Eustache, the chapel of St. Francois de Paule, and the "Presentation in the Temple." He married the painter Virginia di Vezzo, of Velletri.

VOUSSOIRS, the individual stones forming an arch, and of which the central one is the keystone. They are always of a truncated wedge-form.

VOW (Fr. *vœu*, from Lat. *rotum*), a promise made to God of a certain thing or action good in itself, and within the dominion and right of the person promising. The practice of vows appears to have formed part of the religious observance of almost all races in any degree civilized; and it largely pervaded the whole ceremonial system of the Mosaic dispensation (Gen. xxviii. 20, Lev. xxvii. 2, 1. Chron. [1 Paralip. Vulg.] xxix. 9, 2 Chron. xxxi. 6, Judges xi. 30, Num. xxx. 2, Judith xvi. 19, Jon. i. 16). The stringency of the obligation of fulfilling a vow when once made, is distinctly laid down (Deut. xxiii. 21; Eccles. v. 4, 5); but it is equally clearly stated, that it is by no means a matter of obligation to make a vow (Deut. xxiii. 22). The practice of making vows continued among the Jews in the time of our Lord; and St. Paul, after his conversion to Christianity, continued to conform to this usage (Acts xviii. 18). It would be out of place to enter here into the question, whether this observance was meant by our Lord to form part of his new dispensation, or to discuss how far the practice of vows, especially of elativity, can be traced as in use among the Christians of the 1st and 2d c.; but it appears quite clear that in the end of the 3d, and all through the 4th, the monastic life became general in the east, and soon afterward spread all over the church. See ANTONY, PAUL, MONACHISM. It is unnecessary to add, that vows, while discarded as a religious observance by the Reformers, enter largely into the system of the Roman Catholic church. The objects of these engagements among Catholics are very various; but they are drawn, for the most part, from what are called the evangelical "counsels," in contradistinction to "precepts" or "commands"—the most ordinary subject of vows being the so-called "evangelical" virtues of poverty, chastity, and obedience. Pilgrimages, however, acts of abstinence, or other self-mortifications, whether of the body or of the will, special prayers or religious exercises, are frequently made the object of vows; and there is another large class of more material objects, as the building of churches, monasteries, hospitals, and other works of public interest or utility, to which mediæval Europe was indebted for many of its most magnificent memorials of piety and of art. Vows in the Roman church law are either "simple" or "solemn." The principal difference between them consists in the legal effects of the "solemn" vow, which, where the subject of such vow is chastity, renders not merely unlawful, but null and void, a marriage subsequently contracted. A "simple" vow of chastity makes it unlawful to marry, but, except in the Jesuit society, does not invalidate a marriage, if subsequently contracted. Catholics acknowledge in the church a power of dispensing in vows; but this is held to be rather declaratory than remissory, and it is not acknowledged in the case of vows which involve any right of a third party. Bishops are held to possess the power of dispensing in simple vows generally; but the power of dispensing in solemn vows and in certain simple vows, as, for example, that of absolute and perpetual chastity, and of the greater pilgrimages, is reserved to the pope. The practical operation of the canon law regarding vows has evidently been much modified, even in Catholic countries, since the French revolution, and the subsequent political changes; but this must be understood to regard chiefly their external and purely juridical effects. So far as concerns their spiritual obligation, the modern Roman theology recognizes little if any change.—See FERRARI, *Bibliotheca Canonica*; André, *Cours de Droit Canon*; Welter and Wetse's *Kirchen-Lexicon*.

VOWEL. See LETTERS.

VOYSEY, CHARLES, b. London, 1828; graduated, Oxford, 1851; curate of Hessele, 1852–59; of Craigton, 1860–61; of St. Marks, Whitechapel, London, 1861; ejected on account of a sermon against endless punishment; vicar of Healaugh, Yorkshire, 1864. In 1865 he published in the *Sling and the Stone*, sermons preached at Healaugh on the atonement, justification, incarnation, and inspiration, which were deemed at variance with the Bible and the 39 articles. The secretary of the archbishop prosecuted him in the chancery court of York minster. From the sentence of condemnation he appealed to the judicial court of privy council, which confirmed the sentence, deprived him of his living, and required him to pay the costs. He has since preached and lectured in St. George's Hall, London, a fund having been raised by men of wealth called the "Voysey establishment fund." His discourses are printed weekly in the *Eastern Post*.

VRIHASPATI, or, as the word is written in Vedic works, **BRHASPATI** (from *br'ih*, probably hymn, prayer, and *pati*, protector, lord), is, in Vedic mythology, the guardian of the hymns or prayers addressed by the pious to the gods, and he is therefore considered as mainly instrumental in insuring the efficacy of the sacrifice. In consequence, he is "the first-born in the highest heaven of supreme light," because the prayers reach him first; he is "seven-faced," because his faces are the seven Vedic meters; and he is "attended by all the companies of gods," or "represents all gods," when the sacrifice is performed. Being thus the "first sharer of the offering," he is sometimes also identified with *Agni*. His function of guardian of the hymns being similar to that of a priest and spiritual teacher, he is further represented as a priest of the gods, who himself "celebrates worship;" as "the observer of truth," and as imparting "virtuous instruction." In

the epic and Purānic mythology, Vrihaspati figures especially as preceptor of the gods and Rishis, and as such he also causes them to perform sacrifices. A new character, however, in which he appears at that period is that of regent of the planet Jupiter; and in the ceremonies performed in honor of the planets, and described in several Purān'as, a special worship is paid him in this capacity.

VRITRA. See **INDRA.**

VUILLAUME, JEAN BAPTISTE, 1798-1874; b. France; member of a family of violin makers. He entered his father's shop, and soon manifested great skill. He settled in Paris in 1818. He imitated the old violin by such masters as Stradivarius and Maggini. He is said to have made 3,000 violins.

VULCAN (the name is probably connected with *fulgere* and *fulgur*, and may be translated the "bright shining one") was the old Italian god of fire. The various myths in connection with Vulcan prove the great antiquity of his worship. Latterly, the character, attributes and history of the Greek Hephestus were transferred to Vulcan, and the two thus became identified. According to Homer Hephestus was the son of Zeus and Hera; later accounts, however, asserting that the latter gave birth to him without any co-operation on the part of her husband. He appears to have been twice violently expelled from Olympus—the first occasion was shortly after his birth, when he was dropped upon the earth by his mother, who was disgusted with his sickly deformity; he was received by the marine divinities, Thetis and Euronyme, with whom he dwelt for nine years. He afterward returned to heaven, and on interfering in a quarrel between his mother and Zeus, the latter seized him by the leg, and flung him from Olympus. After falling for a whole day, he alighted on Lemnos, where he was kindly received by the Sintians. He afterward returned to Olympus. Homer makes him lame from his birth, while later writers attribute this defect to his second fall on Lemnos. The popular notion of Vulcan or Hephestus appears to have been that of a burly, lame, good-natured, awkward god, often made the butt and laughing-stock of his fellows. He had a magnificent palace of his own in Olympus, "immortal, brazen, shining like stars," in which was his workshop, containing an anvil and 30 bellows which worked at his command. Later accounts locate his workshop in the interior of some volcanic isle, such as Lemnos, Lipara, Sicily, etc., and give him as workmen the Cyclopes, Brontes, Steropes, etc. Many wonderful works of art are ascribed to Vulcan by the ancient poets, and as an artist or artificer, he appears to have been regarded as corresponding in some respects to Athens: both instructed men in the useful and ornamental arts, had the power of healing, etc., and at Athens had temples and festivals in common. In the *Iliad*, the wife of Hephestus is Charis; while in the *Odyssey*, and in later writers, he is represented as being much tormented by the amours of his frail and charming spouse Aphrodite, with her favorite Ares (Mars). In the earlier statues, his lameness appears to have been indicated; but latterly, he was represented as a full-grown, vigorous man, with a beard.

VULCAN, a supposed planet which is probably revolving around the sun within the orbit of Mercury. About a quarter of a century ago Leverrier found certain perturbations in the motions of Mercury which indicated the existence of another body in the vicinity. Such a body could be no other than another planet. Less than three years after Leverrier's announcement Dr. Lescarbault announced that he witnessed the transit of the planet across the sun's disk. MM. Porro and Wolf of Zurich believe they saw it making a transit in 1876, but it has not been observed since. According to Kepler's law its revolution around the sun should be accomplished in about one month; and if it exists, it will probably not escape discovery many years longer.

VULCANISM, a term proposed by Humboldt to include all the evidences of internal heat, such as volcanoes, hot springs, etc.

VULCANITE AND VULCANIZED INDIA-RUBBER See **CAOUTCHOC.**

VULCANO, or VOLCANO, the southernmost island of the Lipari group, in the Mediterranean sea, 12 m. n. of the coast of Sicily. It is 7 m. long, 3 m. wide, and contains the crater of a volcano 1200 ft. high, $\frac{1}{4}$ m. in circumference and $\frac{1}{4}$ m. in depth, from which issue sulphurous gases and vapors charged with vitriol, ammonia, etc. The soil is very fertile, producing grain, fruit, and grapes. The islet of Vulcanello, lying off the n. coast, containing 2 craters, is connected with it by a neck of land formed by volcanic eruptions.

VULGATE is the name of the Latin translation of the Bible, which is the received version in the Roman Catholic church. It must not be confounded with the older Latin translation known as the *Itala* (see **ITALIC VERSION**). While Jerome was engaged in correcting the *Itala*, he conceived the plan of producing a completely new version of the Old Testament, done from the Hebrew text itself. He commenced this labor about 385 A.D., and completed it in 405. He also made an improved version of the *Italic New Testament*, and the two together received the name *vulgate*. The discrepancies between the *vulgate* and the *Itala*, which had been made from the LXX., were so numerous and important, that the charge of heresy and falsification of Scripture was openly preferred against the translator by Rufinus, and even St. Augustine was doubtful for some time whether this charge might not be true. But gradually it made its way into the church, first in Gaul, then in Rome—chiefly through Gregory the great—and finally throughout

the west. About two hundred years after Jerome's death, it became the universally received version of the church. Not long, however, did it exist in its pure and unadulterated form. Partly through the influence of the emendated Itala, partly through the manifold general causes of neglect, hastiness, and the rest, which have gone so far spoil almost every ancient MS., the text of the vulgate had become so corrupted, that in 802, Charlemagne commissioned Alcuin to revise it by old MSS. and to compare it to with the original texts. This revision, however, to which afterward came other "emendations," in the 11th and 12th c. (by Lanfranc, archbishop of Canterbury, and cardinal Nicolaus respectively), completely changed the original character of the work. Nor did the "Correctoria Biblica" (i. e., certain collections of commentated and revised texts, issued at the period), do much for the improvement of the corrupted MSS. The confusion between the different codices was chiefly remarked, when the Tridentine council, in 1546, first declared the vulgate the authorized version of the Roman church, and decreed the preparation of an authenticated edition. In 1564, the papal chair undertook the task; but not before 1590 did Sixtus V. produce the work. This, however, turned out to be so utterly incorrect and faulty throughout, that the copies were speedily suppressed; and another edition, which appeared in 1592, was prepared under Clement VIII., to which in the next year, 1593, that other edition succeeded, which has since remained the normal edition of the church of Rome, and has been reprinted unchanged ever since. We may add, that the Anglo-Saxon translation of the pentateuch and Joshua, by Aelfric (10th c.), has been made from the Vulgate, and not, as has been erroneously supposed, from the septuagint; and that the vulgate has also been repeatedly translated into Arabic (the Psalms even into Persian) for the use of the Roman Catholics in the east.

VULNED, a heraldic term, applied to an animal, or part of an animal—as, for example, a human heart, wounded, and with the blood dropping from it. A pelican in her piety (see PELICAN) is sometimes described as vulning herself.

VULPIUS, CHRISTIAN AUGUST, 1762–1827, b. Germany; educated at Jena and Erlangen. He was a voluminous writer of dramas, romances, operas, etc. His *Rinaldo Rinaldo, der Räuberhauptmann*, published in 1797, was once famous, and was widely imitated.

VULTURE. *Vultur*, a Linnæan genus of rapacious birds, now forming the family *vulturidae*, to almost all the species of which the name Vulture is popularly given. The *vulturidae* have a longer beak than the *fulconidae*, and it is straight at the base, slightly or not at all toothed; the upper mandible longer than the lower, and hooked at the tip, the head generally bare, or covered only with a short down, which in most of the species is the case also with the neck—a ruff or collar or soft feathers surrounding the lower part of the neck, into which the upper part, and even most of the head, can be withdrawn. The legs and feet are large, but the claws are not nearly so large and strong as in the *fulconidae*, and are but slightly hooked. The middle toe is very long. The wings are long, and their expanse consequently great. Vultures have great powers of flight, and many of them soar to a very great height in the air. Their plumage has not the neat and regular appearance of that of the *fulconidae*, but it is dense, and not easily penetrated by shot. Vultures are mostly found in warm climates, and many of them are inhabitants of mountainous regions. They feed on carrion, which it seems to be their office in nature to remove from the face of the earth, that the evil consequences of its corruption may be prevented. They seldom attack a living animal, but they have been seen to sit and watch the approach of death, waiting for their feast. They are not in general courageous birds, and are often put to flight by birds much smaller than themselves; yet, if unmolested, they readily become familiar with the presence of man, and some of them seek their food even in the streets of towns, in which they are useful as scavengers. They gorge themselves excessively when food is abundant, till their crop forms a great projection, and sit long in a sleepy or half-torpid state to digest their food. They do not carry food to their young in their claws, but disgorge it for them from the crop. The bareness of their head and neck adapts them for feeding on putrid flesh, by which feathers would be defiled; and they are very careful to wash and cleanse their plumage. The question has been much discussed, whether vultures discern dead animals by the eye, or are attracted to them by the smell. It is certain that they possess great powers both of smell and of vision, and the reasonable conclusion appears to be that both are of service in directing them to their prey. The rapidity with which they congregate to a carcass has been remarked with admiration, and vast numbers have often been seen assembled on a battle-field to devour the dead.

The *vulturidae* are divided into several genera, of which one, *gypætos* approaches to the *fulconidae* in its characters and habits, having the head feathered, and not always feeding on carrion, but often attacking living animals. The *Rümmelger* (q. v.) is one of this group. The feet are feathered to the toes, while the other vultures have the tarsi bare.

Some of the most notable species of vultures have already been described, as the condor and the Egyptian vulture. The generic name *vultur* is now restricted to those which have the head and neck without feathers and without caruncles, and a ruff of long feathers or of down at the lower part of the neck. To this genus belongs the

TAWNY VULTURE or **GRIFFON** (*V. fulvus*), found in the south of Europe, the north of Africa, and the west of Asia. It makes its nest on the most inaccessible rocks of high mountains, as in the Alps and Pyrenees, and sometimes in tall forest trees. It is a very large bird, more than four ft. in length. Its plumage is yellowish brown, the quills and tail-feathers blackish brown, the down of the head and neck white, the ruff white. When it has found a carcass on which to feed, it remains on the spot, gorging and torpidly resting by turns, till no morsel remains. This vulture has been seen in England, but only as an accidental visitor. The mountains and forests of the south of Europe, as well as of the north of Africa, and great part of Asia, are also inhabited by the **CINEREUS VULTURE** (*V. or gyps cinereus*), another large species, which departs from the typical character of the vultures in having the greater part of the neck feathered, and comparatively large and powerful claws. It does not, however, attack living animals. India, Africa, and almost all warm countries, abound in vultures of different species which it is unnecessary to describe. In the southern states of North America is found the **BLACK VULTURE** (*Cathartes atratus*), there generally known as the **CARRION CROW**, a comparatively small species, not quite two ft. in entire length, of a deep black color, the head and neck covered with warty excrescences, and a few hair-like feathers. This bird is also very abundant in many parts of South America, where it is called the **GALLINAZO**. Very nearly allied to it, and found in the same regions, is the **TURKEY BUZZARD**, or **RED-HEADED VULTURE** (*Cathartes aura*). These vultures are more or less gregarious, not only assembling where food is to be found, but flying in flocks. They make their nests in hollow trees, and sometimes in the chimneys of deserted houses, or on the roofs of houses. In some of the towns of tropical America, they may be seen in great numbers, perched during the heat of the day on the tops of houses or on walls, asleep, with their heads under their wings. The **CALIFORNIA VULTURE** (*Cathartes Californianus*) is the largest rapacious bird of North America, being fully four ft. long, and about ten ft. in extent of wings. It is black, with a white band on the wings. It is found only on the western side of the Rocky Mountains. It much resembles the condor in its habits.

VYĀSA is the reputed arranger of the Vedas (q.v.), and the reputed author of the Mahābhārata (q.v.), the Purāṇas (q.v.), the Brahmasūtras (see VEDĀNTA), and a Dharmaśāstra. According to tradition, he was a son of the sage *Parasara* and *Satyaratī*, "the truthful," who was a daughter of king Vasu, and a heavenly nymph, Adrikā. Another tradition makes him also the father of *Dhṛitarāshṭra*, *Pāṇḍu*, and *Vidura*. On account of his dark complexion, he was called *Kṛishṇa* (black); and, because he was born in an island (*dvīpa*) of the Yamunā (Jumna) river, his second name was *Draipāyana*. That the immense bulk of literature comprised by the above-named works, and relating to different periods, cannot belong to the authorship of one and the same personage, is no matter of doubt. But the name itself of the individual to whom it is attributed conveys the meaning which must be sought for in some of the legends connected with his history. *Vyāsa* (from the Sanskrit *vi* and *as*, literally, "throw in different direction," hence "distribute") means the person who arranges a subject-matter in a diffuse manner, or the act itself of such a diffuse arrangement, and is often contrasted with *saṁdśa* (from *saṁ* and *as*, contract), the act of making a concise arrangement, or of abridging (compare the Greek *omēro*, from *om* = *saṁ* = *sun*, and *ar* = *as*). Vyāsa is, therefore, a symbolical representation of the work of generations, as embodied in the Vedas, the Mahābhārata, and the Purāṇas, and of the order which gradually was brought into this literary mass. When, therefore, the Vishṇu-Purāṇa speaks of 28 Vyāsas who in the reign of the present Manu arranged the Vedas, it is not impossible that some historical truth may underlie this statement, implying, as it does, a different arrangement of the Hindu scriptures at various times: and that the Mahābhārata, and the Purāṇas too, may have undergone various arrangements and recensions, until they settled down in their present form, sufficiently results from their contents. Regarding the Brahmasūtras, tradition itself seems only loosely to connect their author with the Vyāsa of the forgoing works, for it says that he was in a former life a Brāhman, *Āyantaśramana*, who, after having attained final beatitude, "by special command of the deity, resumed a corporeal frame and the human shape, at the period intervening between the third and fourth ages of the present world, and was the compiler of the Vedas." (See Colebrooke's *Miscellaneous Essays*, vol. i. p. 327, Lond. 1837.) As the author of the Dharmaśāstra, Vyāsa is possibly a personage distinct from the legendary individual bearing this name, as is the case with other Vyāsas who occur as authors of other works.

W

W, THE twenty-third letter of the English alphabet, "is a letter which performs the double office of a consonant and a vowel." According to the decisive experiments of prof. Willis (*Cambridge Phil. Trans.* iii. 231), the natural order of the vowels is *i, e, a, o, u*, or the reverse; in which the sounds must be understood to be those which prevail on the continent. The sounds, then, of *i* (that is, *ee*) and *u* (that is, *oo*) are the most remote, and the attempt to pass with rapidity from either of these to

the others, more particularly to the other extreme, gives an initial breathing which has the character of a consonant, viz., in the one case, *eo-oo*, or *you*; in the other, *oo-ee*, or *we*. See Key's *Alphabet*. This acute analysis of the articulations denoted by the characters *e* and *y* throws a clear light on the double function they perform as consonants and as vowels. The letter *e*, which originated in the middle ages, is merely one *e* joined to another, as its English name imports. It is peculiar to the English, German, and Dutch alphabets. It would appear, from a variety of phenomena in Latin and Greek, that the Latin *e* or *u*, used as a consonant, as well as the old Greek digamma (Ξ), were more of the nature of the modern *w* than of the decidedly consonantal English *v* (see U and V). The French having, like the other Romanic nations, no character *w*, express the sound by prefixing *ou* to the vowel; as *ouï* (pron. *wee*), Edouard = Edward. In the beginning of proper names they substitute *gu*; e.g., Guillaume = William. The Spaniards also use *gu*, as in the many names compounded of the Arabic *wadi*; e.g., Guadalquivir; but more frequently *hu*, as in Chihuahua (pron. *Chiwawua*). In High-German, which has become classical German, *w* is confounded with *v*, and *v* with *f*; thus, Wellington is pronounced *Fellington*. In London, *w* is substituted for *v*, and *v* for *w* with "a most amusing perversity."

WAA'GEN, GUSTAV FRIEDRICH, 1794-1868; b. Hamburg; studied at Breslau, Dresden, Heidelberg, and Munich; was director of the royal gallery of paintings in Berlin, 1823, and of the portrait gallery of the new museum there, 1832; lectured on the history of art in Berlin, 1844. He published a pamphlet on Egyptian mummies; an essay on Hubert and Jan van Eyck; *Kunstwerke und Künstler in England und Paris*; *Treasures of Art in Great Britain*; and many other valuable works.

WAAL, Tue (Lat. *Falis* or *Fahalis*), an arm of the Rhine, thrown off near the village of Panmerden, in the Netherlands; flows thence to Nijmegen, Tiel, Nieuw-St.-Andries, between the Boemmeler and Tieler-waard, and unites with the Maas below fort Loevestein (Luvestein). The united rivers then take the name of the Merewede, which, flowing past Gorinchem and Dordrecht, becomes the Oude, or Old Maas. See MAAS.

WA'BASH, a river of the United States of America, rises in western Ohio, runs w. and s.w. through Indiana, forming the southerly half of its western boundary, on the borders of Illinois, to the Ohio river, 146 m. from its mouth, is 550 m. long, and navigable by steamers at high water 300, and has for its principal branches the Tippecanoe, Big Vermilion, Embarras, and White river—the last 200 m. long. The Wabash and Erie canal connects the lakes with the Mississippi.

WABASH, a co. in s.e. Illinois, having the Wabash river for its s.e. boundary; 200 sq.m.; pop. '80, 9,945—9,471 of American birth, 57 colored. Co. seat, Mount Carmel.

WABASH, a co. in n.e. Indiana, drained by the Wabash and other rivers; 430 sq.m.; pop. '80, 25,242—24,297 of American birth, 268 colored. Co. seat, Wabash.

WABASHA, a co. in s.e. Minnesota, bounded on the e. by the Mississippi river, where the bluffs rise 400 ft. high; 570 sq.m.; pop. '80, 18,206—13,285 of American birth, 58 colored. Co. seat, Wabasha.

WABASH COLLEGE, at Crawfordsville, Ind., a Presbyterian institution founded in 1833. The college grounds contain 33 acres, beautifully shaded with native forest trees. There are four college buildings, and besides the usual collegiate departments, with classical and scientific courses, there is an English and mercantile course, and a preparatory department. The philosophical and chemical apparatus is valuable; there is a cabinet of 30,000 specimens, and a library of 12,000 vols. Scholarships are available for students of good qualifications who are unable to meet their own expenses. In 1878 there were 12 professors and 96 students.

WABAUN'SEE, a co. in n.e. Kansas, having the Kansas river for its n. boundary; 900 sq.m.; pop. '80, 8,757—7,380 of American birth, 681 colored. Co. seat, Alma.

WACE, ROBERT, an Anglo-Norman poet of the 12th century. Many different versions of his name are given in his own books, as well as in the other books which mention him. He is styled Wace, Waace, Waice, Waice, Waze; Gasse, Gaice, Guace, Guazi, Guaze, Guascoe, Gazoe; and again, Wistace, Huistace, Huace. It has been supposed that there were really two poets, the one named Wace or Guace, the other named Wnistace; the one the author of *Le Roman du Rou*, the other of *Le Roman du Brut*. But variety in writing names was very common in the middle ages, and it does not seem necessary to resort to this supposition. About his Christian name there is even more doubt than about his surname. It is never mentioned in his poems, from which the little that is known about him is mostly derived. An old writer speaks of him as Matthew; and it seems that he was first called Robert in the *Origines de Caen* by Huet, whom subsequent authors have followed.

Wace was born in Jersey, in the reign of Henry I., and it is probable that the date of his birth lay between the years 1112 and 1124. He was taken to Caen as a child, and there he received the early part of his education. He was afterward sent into the neighboring kingdom of France; but he returned to Caen, and having entered into holy orders, became a reading-clerk in the royal chapel there. At Caen it was that he composed his works. Henry II., to whom he dedicated *Le Roman du Rou*, gave him a

canonry at Bayeux, apparently about the year 1160. He died in England about the year 1180, certainly before the year 1184.

Five separate works are attributed to Wace; but three are slight, short performances, and it is only necessary to notice the two principal—*Le Roman du Brut d'Angleterre* and *Le Roman du Rou*. The former premises that a certain Brutus, a son of Ascanius, and grandson of Æneus, settled in Britain, and became its first king. The book continues the history of the British kings from Brutus to Cadwallader, who died at Rome shortly before the year 700. It is little more, however, than a literal translation into the French from the Latin of Geoffry of Monmouth (q.v.). This poem seems to have been completed in the year 1155. *Le Roman du Rou* (Rollo) is a sort of history of the dukes of Normandy and of the Norman monarchy in England. Neither of these works has the slightest poetical merit. They are both interesting only as showing the state of the French language in the 12th c., and as supplying occasional facts and social traits to the historian.

WACHUSETT MOUNTAIN, in Princeton, Worcester co., Mass., 16 m. n. of Worcester, 8 m. s.w. of Fitchburg, is 2,018 ft. high. From its summit is to be had one of the finest views in New England, including parts of six states. Hotels and boarding-houses have been built near it in the last few years, and it has become a summer resort.

WACKÉ, a German miners' term, introduced by Werner, to designate a soft variety of trap, that has an argillaceous aspect and a greenish-gray color. It resembles indurated clay, but has been formed of volcanic ashes or mud. It is often vesicular, and when the cavities are filled, it becomes an amygdaloid. It is associated with trappean rocks, and, indeed, often passes into basalt or greenstone.

WACO, a city and co. seat of McLennan co., Texas, on the Brazos river, and the terminus of the n.w. branch of the Texas Central Pacific railroad; pop. '80, about 12,500. The Brazos is crossed at this point by a suspension bridge, 472 ft. long. Waco has a large cotton and woolen factory, iron and brass foundries, 2 flouring mills, a convent, university, and female college, and 2 daily and 3 weekly papers.

WAD, the popular name given in some parts of England, as in Derbyshire, to an ore of manganese, which is a hydrated peroxide, united with nearly its own weight of oxide of iron. Wad is also the provincial name of black-lead or plumbago in Cumberland.

WAD, in gunnery, a compressible disk forced home in the barrel after the powder, to confine the latter to the least possible space before its explosion. For great guns, the wad is commonly made of rope; for small-arms, of pasteboard.

WADAY, a country of central Africa, s. of the Great Desert, and w. of Darfoor. It is called also Dar Saleyh and Borgoo. Its length from n. to s. is 600 m., and width 400 m.; pop. 2,500,000. It is generally level, though there are many isolated mountains. From the highland on the e. two streams flow through its valleys; uniting to form the Bahr-el-Gazal, which periodically changes the plain of Fitrié into a lake; and the Bahr-Iro, another river, flows n.w. through Waday, from the mountains of Marrah. A desert tract on the e. separates Waday from Darfoor; and on the n. is the mountainous and rocky desert of the Tibboos. The s. portion is better watered and more fertile than the northern. Rice, maize, and other grains, as well as all tropical fruits, are raised. Palm, ebony, and sandal trees are abundant. The principal occupation is the rearing of cattle and horses. The people know how to spin and weave cotton, are skillful workers in iron, and can make coarse implements; but the manufactured articles most prized are imported from Egypt or Barbary, for which they exchange ivory, gum, ostrich feathers, salt, copper, tobacco, skins, and slaves. The population consists of Arabs, and 26 tribes of negroes, governed by a sultan who resides at Abeshir, having under him 4 provincial governors. The religion is a mixture of Mohammedanism and paganism. The kingdom has existed 800 years.

WADDELL, JAMES, D.D., 1739-1805; b. Ireland; brought in infancy by his parents to Pennsylvania; educated at the classical school of the rev. Dr. Finley, Nottingham, Md.; became his assistant; taught at Pequea, Penn.; relinquished the study of medicine, and by advice of rev. Samuel Davies, studied theology; licensed by the presbytery of Hanover, 1761; pastor of churches at Lancaster and Northumberland; removed, 1785, to an estate which he called Hopewell, preaching in various churches for 20 years. Soon after his last removal he became totally blind. His remarkable eloquence is described by William Wirt in the *British Spy*. He was the father-in-law of rev. Dr. Archibald Alexander of Princeton.

WADDELL, JAMES IREDELL, b. N. C., 1824; entered the navy as midshipman, 1847; lieut., 1855. In 1860 he was on the China station, and successfully conducted an expedition into the interior. In 1861 he resigned his commission and became a lieut. in the confederate navy. He was engaged in the Drury's Bluff action, where the union fleet was repulsed; in 1863 was sent to Europe on "special service;" and in Oct., 1864, took command of the noted cruiser, the *Shenandoah*, which was built at Glasgow; sold to a confederate agent by Liverpool owners, and handed over to Waddell near the Madeira islands. From Melbourne the *Shenandoah* started on a cruise lasting 13 months, in which she captured 38 vessels, and of these destroyed all but six. The cruise lasted until August, 1865, long after the surrender of Lee, and in November

of the same year the steamer was turned over to the British government. Capt. Waddell spent some time in European travel, and on his return to this country entered the Pacific Mail company's service.

WADDELL, MOSES, D.D., 1770-1840; b. N. C., graduated Hampton-Sidney college, Va., 1791; ordained a Presbyterian minister, 1792; established a classical boarding-school at Willington, S. C.; president of the university of Georgia, 1819-29. He was an eloquent preacher and an eminent instructor.

WADDING, LUKE, 1588-1657; b. Ireland; studied at the Jesuit college, Lisbon; joined the Franciscans, 1605; ordained and taught theology at the university of Salamanca; accompanied as chaplain the bishop of Cartagena to Rome, 1618, sent to settle the controversy concerning the immaculate conception—an account of which embassy he wrote in a folio volume; founded at Rome the college of St. Isidore, 1625; was procurator of Franciscans at Rome, 1630-34; vice-commissioner of the order 1645-48; was one of the papal counselors to settle the Jansenist controversy. He published *Annales Ordinis Minorum*, *Scriptores Ordinis Minorum*.

WADDINGTON, WILLIAM HENRY, b. Paris, 1826, of English parentage; graduated at Cambridge, 1849; became a naturalized citizen of France, and made archeological explorations in Asia Minor in 1850 and 1862, the results of which are described in several books. In 1871 he was elected to the national assembly, supported Thiers, and by him was made minister of public instruction, 1873. He resigned with Thiers and voted with the left-center, or moderate republicans. In 1876 he was elected senator for the department of the Aisne, was again minister of public instruction in the Jules Simon cabinet, and in 1877 became minister of foreign affairs in the Dufaure cabinet; in 1878 was a representative of France at the Berlin conference, and resigned in 1879.

WADE, BENJAMIN FRANKLIN, 1800-78; b. West Springfield, Mass.; removed to Ohio, 1821; studied law; admitted to the bar, 1828; elected prosecuting attorney of Ashtabula co., 1835; state senator, 1837, and twice re-elected; chosen presiding judge of the third judicial district of the state, 1847; U. S. senator, 1851; re-elected 1857 and 1863. He was a strong opponent of slavery; voted for the repeal of the fugitive slave law, 1852; opposed the Nebraska-Kansas bill of 1854, and the purchase of Cuba. After the election of Mr. Lincoln, 1860, he opposed all compromise between the north and the south; was appointed chairman of the committee on the conduct of the war, and advocated a more vigorous policy, urging a law to confiscate the property of the leading secessionists and emancipate the slaves; reported in 1862, as chairman of the territorial committee, a bill to abolish slavery in all the territories, and prohibit it in all future territories; was elected president of the senate, 1867; was sent, 1871, as one of the commission to San Domingo to report in relation to its annexation to the United States. He had great positiveness of convictions and aggressive force.

WADENA, a co. in central Minnesota, consisting of fertile prairies drained by numerous rivers; 540 sq. m.; pop. '80, 2,080—1,746 of American birth. Co. seat, Wadena.

WADERS, or **WADING-BIRDS**, a designation often applied to the whole order of birds *grallæ* (q.v.), or *grallatores*, but really appropriate only to some of them, the more aquatic in their habits, as herons, snipes, and rails.

WADHAM COLLEGE, Oxford. In the year 1610, James I. issued a license to Dorothy Wadham, acting as executrix of the will of her deceased husband, Nicholas Wadham, esq., to found a "college of divinity, civil and canon law, physic, good arts and sciences, and the tongues." Dorothy Wadham purchased the site and ruins of the priory of the Austin friars, in the suburbs of Oxford, and built the present college for a warden, 15 fellows, 15 scholars, and 2 chaplains. The fellows were formerly elected from the scholars, and the tenure of the fellowships was limited to 22 years; nine of the scholarships were limited to certain counties, and to the founder's kin. By the commissioners under 17 and 18 Vict. c. 81, the fellowships and scholarships were thrown open—the former to all persons who had passed the examinations for a B.A. degree; the latter to all persons under 20 years of age. The commissioners also abolished the limitations on the tenure of the fellowships. At present, the number of fellowships is fourteen, one of them having been appropriated to the professor of experimental philosophy. The scholarships are worth £80 a year, besides rooms, and are tenable for five years. There are several good exhibitions, especially those founded by Dr. Hody—four for Hebrew and six for Greek, value £45 a year, and tenable for four years; also a law exhibition for a fellow, value £90 a year; and a medical exhibition for a fellow, of the same value. There are thirteen benefices in the gift of this college.

WADI, an Arabic word signifying a river, a river-course, a ravine, or valley. It is supposed that the Greek *oasis* is a corruption of *wadi*. It is of frequent occurrence in the names of places; e.g., Wadi-Musa (i.e., the valley of Moses) in Arabia. In Spain, where most of the rivers bear names given them by the Arabs, *wadi* has been transformed into *guad*; e.g., Wadi-l-abyadh (the white river) has become Guadalquivir.

WADSET, in Scotch law, is the old name for a mortgage (q.v.). The modern name is bond and disposition in security. See **HERITABLE SECURITIES**.

WADSWORTH, BENJAMIN, D.D., 1669-1737; b. Mass.; graduated at Harvard college, 1690; was associate pastor, with Mr. Foxcroft, of the First church, Boston, 1696-1725; elected president of Harvard college, 1725. He published sermons and theological treatises.

WADSWORTH, JAMES, 1730-1817; b. Conn.; graduated at Yale college in 1748. He was town clerk of Durham, Conn., 1756-86; became a brig.gen. in the continental army in 1776; was a member of the Conn. committee of safety, and had charge of the defense of the Connecticut sea-coast in 1777. In 1777 he was appointed maj.gen. in the Conn. militia. He was afterward judge of the New Haven county court of common pleas, and a member of congress, 1783-86.

WADSWORTH, JAMES, 1768-1844; b. N. Y.; graduated at Yale college, 1787; purchased with his brother a large tract of land in the Genesee valley, 1790; became one of the wealthiest land owners in the state; was much interested in education, and at his own expense printed and circulated pamphlets, employed lecturers, and offered premiums to the towns which established school libraries; advocated as early as 1811 the formation of normal schools, and was instrumental in founding the state normal school; founded and endowed an institution and library at Genesee for scientific lectures. In the sale of his lands he stipulated that two tracts of 125 acres each in every township should be free for a church and a school.

WADSWORTH, JAMES SAMUEL, 1807-64; b. N. Y.; studied at Hamilton and Harvard colleges; having studied law, he assumed the care of the family estates; was made brig.gen. of volunteers in 1861, and military governor of Washington city, 1862; participated in the battle of Fredericksburg; at Gettysburg his division was the first to engage the enemy, and through the day lost 2,400 out of 4,000 men; during the second and third days' fight maintained the heights on the left of the line. In the Richmond campaign of 1864 his division crossed the Rapidan May 5, and in the evening suffered severely in a conflict of several hours. On the following day he was struck in the head with a bullet and died Sunday, May 8.

WADSWORTH, PELEG, 1748-1829; b. Mass.; educated at Harvard, and went into business. Entering the continental army as capt. of a company of minute-men, he was aid-de-camp to gen. Ward, adjt.gen. of Massachusetts, and in 1777 appointed brig.gen. He was captured on the Penobscot expedition, where he was second in command. Settling in Maine in 1784, he was a state senator in 1792, and member of congress, 1792-1806. The government granted him a large tract of land for his services.

WAFER, in relation to the Roman Catholic usage of the eucharistic communion, is the name given (chiefly by non-Catholics) to the thin circular portions of unleavened bread which are used in the Roman church in the celebration and administration of the Eucharist. In ancient times the bread and wine for the Eucharist were contributed by the faithful; and a place is found in the eucharistic service of every known liturgy for this offering, still known by the name of offertory (q.v.). But in the Latin church, for many centuries, the bread (which, as being unleavened, and different from that in common use, needed special preparation) has been provided by the clergy; and the practice has been followed of preparing it in the form of thin cakes, commonly, although not necessarily circular, and frequently impressed with sacred representations or emblems, as the crucifixion, the lamb, the Christian monogram, the cross, and other sacred symbols. The circular form itself is by some ritualistic writers regarded as symbolical, the circle being a figure of perfection. The wafers used in the Roman Catholic church are made of different sizes, the smallest about an inch in diameter for the communion of the people, a second considerably larger for the celebration of the mass, and a third still larger to be placed in the monstrance (q.v.) for the service of benediction or exposition. See LORD'S SUPPER.

WAFERS, thin disks of dried paste, mostly colored, used for sealing letters, or for attaching papers together. They are made by mixing fine wheaten flour with water and any non-poisonous coloring materials, so as to form a mixture not thicker than thin cream. A small quantity of this is poured on the lower limb of a pair of wafer-irons, which are formed like a pair of pincers, but with flat blades about 12 in. long by 9 in breadth, the inner surface of which is kept well polished. Before being used they are heated over a charcoal or coke fire, and the liquid paste being poured on the lower blade, the pressure of the two blades distributes it equally in a thin sheet between them, the superfluous material being squeezed out at the sides, from which it is shaved off by means of a knife. In a few seconds of time, if the blades are hot enough, the sheet of paste becomes dry and half baked. The sheets so formed are then stamped out into disks of the sizes required. Formerly, wafers were very extensively used, and their manufacture was one of considerable importance; but the introduction of gummed envelopes has almost driven them out of use.

WAGENINGEN, an old but well-built t. in the Netherlands, province of Gelderland, is situated near the Rhine, to which access is had from it by a canal. Pop. '75, 6,005. Wageningen has good schools and other useful institutions. The environs are beautiful, and the Wageningische Berg, now formed into a burying-place, is especially picturesque.

Ship-building, brick and tile-making, tanning leather, rope-spinning, etc., with agriculture, are the chief sources of wealth. Wageningen received the rights of a town in 1263. It is a neat, purely Dutch town, selected as a residence by many who wish to live quietly, comfortably, and economically.

WAGER OF LAW, in the law of England, was an old form of giving sureties that at some future time the party would wage his law—that is, put it to the oath of the defendant, who swore in presence of eleven compurgators as to the debt claimed. The action was used in causes where there was some secrecy as to the origin of the debt, or where the defendant bore a fair character. That form of action had long been in disuse, but was not formally abolished till the statute of 3 and 4 Will. IV. c. 42.

WAGER-POLICY, in insurance, a policy in which the insured has no insurable interest. Such insurance contract is void in law as contrary to public policy. Before this was definitely settled policies of the kind were sometimes given the words "interest or no interest," or "without further proof of interest than the policy," being inserted.

WAGERS, in the common law of England, were held good, if they were not against the principles of morality, public decency, or sound policy; and a wager or bet was defined to be, a contract entered into without color or fraud between two or more persons for a good consideration, and upon mutual promises to pay a stipulated sum of money, or to deliver some other thing to each other, according to the result of some contingency. A wager has been held void which was made on the life of Napoleon I., on the result of an election of a member to serve in parliament, etc. Before the statute of 8 and 9 Vict. c. 109, wagers above a certain amount were declared to be illegal, but now wagers on a race are not illegal. That statute provides that all contracts or agreements, whether by parole or in writing, by way of gaming or wagering, shall be null and void, and the money due thereon cannot be recovered in any court of law; but that enactment does not apply to any subscription or contribution or agreement to subscribe or contribute for any plate, prize, or sum of money to be awarded to the winner or winners of any lawful game, sport, pastime, or exercise. If a sum of money has been deposited with a stakeholder, not as a stake, but by way of wager, it may be recovered back if notice is given to the stakeholder before the event comes off. As no wager can be recovered in a court of law, it is merely a debt of honor, and if paid, it is in the eye of the law the same thing as giving a gratuity. If a promissory-note or bill of exchange be taken as security for money either won by betting or knowingly lent for betting, the consideration is illegal, and the money cannot be recovered. A recent act was passed for the suppression of betting-houses, and imposes penalties on persons keeping or using houses for betting purposes (17 and 18 Vict. c. 119); and justices may authorize constables to break into such houses, and arrest all persons found therein. Whoever by a cheating wager wins money from another, is liable to be indicted for obtaining the money by false pretenses.—In the law of Scotland, wagers are treated as *pacta illicita*, which it is beneath the dignity of any court to entertain questions about, and so they are not recoverable by action. The act 8 and 9 Vict. c. 109 does not apply to Scotland, but there are older statutes of a somewhat similar effect.

WAGERS (*ante*), in the United States, have been held void if immoral, indecent, tending to restrain marriage, or (as given in a Pennsylvania decision) if relating to the age, height, weight, wealth, situation, or circumstances, of any person; also, any likely to interfere with the exercise of the elective franchise. Many states have statutes making all wagers null and void, and in others an elector is disqualified either by statute or by constitutional provision from casting his vote at an election in regard to which he has made a wager. Even when legal the stakeholder's authority may be rescinded by either party before the event, and the money recovered by trover or assumpsit actions.

WAGES means the money given for personal services, as distinct from the price of anything sold, whether made by the seller or not. When a man makes a basket, and sells it, the price is not wages, though it may be the same thing to him. The term has by general usage been limited to the remuneration of hand-working. A manager of a bank or railway—even an overseer or a clerk, in a manufactory—is said to draw a salary. It is generally a feature of wages, too, that they are paid at short intervals, as being necessary for immediate support. This division is connected with social distinctions which have exercised a baneful moral influence in the direction of improvidence. The clerk at a hundred a year is supposed to be a gentleman who dresses decently, and so adjusts his expenditure that he can draw it quarterly. The puddler or shingler who can make a guinea a day is, by traditionary usage, a member of the needy classes, who requires to draw his wages weekly, and is expected to spend them at once. Wages are more absolutely ruled by their value in the market than other services. A writer of poems or a painter of pictures does work which is exceptional—if people are willing to pay him any price he may ask for his work, there is probably no one who can compete with him and undersell him. A lawyer or a physician may also have special qualities to a great extent excluding competition; and in appointments to offices requiring trust, judgment, and skill, a great many things have to be considered besides the question, who will do the duty cheapest? But in the staple hand-works—the making of clothes, the baking of bread, and the like—there are uniform functions of the hand which a

certain number of persons will always be found ready to give for a price. Strong efforts are made from time to time—by combinations, strikes, etc.—to make wages fictitiously high. These efforts are of course often successful for a time, bringing profit to some members of the working-classes, though injury to others, and a general loss of the wealth of the community. But the great law of political economy, that labor as well as all other things, will bring what it is worth, ever prevails in the end in a country where trade and labor are free. See CAPITAL, COMBINATION, LABOR, TRUCK-SYSTEM.

WAGNER, RICHARD, a contemporary German operatic composer. He was born at Leipsic in 1813, and was educated at Dresden and Leipsic. In 1836, he was *Kapellmeister* at Magdeburg, and after spending some time in Königsberg, Dresden, and Riga successively, he came to Paris in 1841, where he composed his two earliest operas, *Rienzi* and *Der fliegende Holländer*. *Rienzi* obtained for him the post of Kapellmeister at Dresden. His next opera, *Tannhäuser*, appeared in 1845. Being involved in the political schemes of 1848, Wagner had to quit Saxony, and resided for a time in Switzerland, where he composed *Lohengrin*. He spent the season of 1855 in London, where he undertook the direction of the philharmonic society's concerts. In 1865, he was invited to Munich, and greatly befriended by the young king of Bavaria, who appointed him director of the opera house; and he there produced his opera of *Tristan und Isolde* the same year; and, in 1868, *Die Meistersinger von Nürnberg*, at the first performance of which Wagner sat beside the king in the royal box. Since that time, his energies have been mainly devoted to the securing of such representations of his works as he and his admirers regard as proportionate to their merits. Wagner has kept himself constantly before the public by pamphlets and the republication of favorable newspaper articles. Wagner unions have been formed in all the principal towns of Germany; and Baireuth, in the n. of Bavaria, has been selected as the most suitable center for a grand Wagner theater, of which the foundation stone was laid with great ceremony, in May, 1872, by the great composer himself, in the presence of a host of his admirers, and for the opening of which (1876) he prepared a great operatic tetralogy, *Der Ring des Nibelungen*. In all his operas, the words of the libretto, Wagner's own composition, are adapted to a declamatory style of recitative, relieved by harmonies and instrumentation in accordance with the spirit of the situation. They are often magnificent in spectacle, but are purposely deficient in what is commonly understood as melody. Wagner's position amounts to this, that the highest mission and true end and object of music is only realized when it is the exponent of poetry; and that instrumental music is practically dead.

WAGNER, RUDOLF JOHANNES, b. Leipsic, Germany, 1823; studied chemistry at Leipsic and Paris. In 1851 he was made professor of chemistry at Nuremberg, in 1856 he became professor of technology at Würzburg, and in 1858, inspector of technical studies in Bavaria. He has written several works of great value on his specialties, of which some have been translated into English. He is editor of the *Jahresberichte über Chemische Technologie*.

WAGON, a vehicle for the conveyance of goods or passengers, is mounted on four wheels, but varies considerably in the construction of its other parts, according to the species of the traffic in which it is to be employed. Since the wagon has four wheels, it is quite unnecessary that any part of the weight should be sustained on the shafts, and accordingly these latter are hinged to the fore-part of the frame, so as to be raised or let down at pleasure. Wagons being generally drawn by two horses abreast, two pair of shafts are employed; and when three horses are yoked abreast, the center one is the shaft horse, the right and left "wheelers" are yoked by traces to the wagon-frame; and each of the latter is attached by a chain from its collar to a shaft, so as to preserve the parallelism of its action. Most wagons are set on springs, on account of the weight of the vehicle, and the absence of the steadying weight of the horse, owing to the shafts not being immovably attached to the frame. For facility in turning, the fore wheels are occasionally smaller than the hind ones; and in addition, the fore axle of the lighter kinds of wagon is attached to the body of the wagon by a swivel-joint, the shafts or pole being in this case attached to the fore axle; but the diminution of the size of the wheels is open to grave objection, on account of the greater friction. It being almost impossible for the beasts of draught to control and subdue the momentum of a heavily-loaded wagon descending a slope, it is necessary to employ a drag of some sort; the rudest forms of which are a thick cylinder of tough wood inserted between two spokes of the wagon which, being carried upward in the wheel's revolution, is "jammed" against the under side of the wagon-frame, and stops the wheel's rotation; and the *chain-drag*, which was merely a chain firmly fastened at one end to the wagon-frame between a fore and a hind wheel, and furnished at the other end with a large hook, to hold the tire of the hind wheel; the method of chaining the fore and hind wheels together was also employed. But in the better class of wagons, the *shoe* and *break* (see DRAG) are now employed. The various forms of wagon in common use are the brewer's *drag*, the railway *lorry*, the agricultural *wain* (in common use in England and on the continent), and the *bullock-cart* of s. Africa. The comparative merits of a vehicle in which the horse has merely to draw, and one, as the cart, in which he has to carry as well as draw, have often been discussed, though never sufficiently tested; but it seems to be generally believed that, despite the distress arising from his confined position in the comparatively immovable

shafts of a cart, a horse can transport a greater weight to a moderate distance by the same exertion of muscular force in a cart than in a wagon.

WAGON-TRAIN, an indispensable companion of an army under this or some other title. It serves to convey the ammunition, provisions, sick, wounded, camp-equipage, etc. At the present time, in the British army, the army service corps performs this function, although in China (1860) and New Zealand (1862-5) the commissariat provided and organized its own wagon-service.

WAGRAM, or **DEUTSCH-WAGRAM**, a village of lower Austria, on the left bank of the Russbach, 10 m. n.e. by c. from Vienna, is of little importance, except as the site of the great battle between the French and Austrians in the campaign of 1809, which forced Austria to bow before Napoleon, and submit to the onerous conditions of the fourth treaty of Vienna (q.v.). After the capture of Vienna, Napoleon resolved to pass the Danube, and complete the prostration of Austria's military strength by the destruction of her last army—that under the archduke Charles; and with this view, he called in the Italian army, under Eugene Beauharnois, and all his outlying corps, concentrating them in and about the island of Lobau; and after a few feints, calculated to mislead the archduke, who, stationed on the n. bank, was vigilantly guarding the various crossings, succeeded in effecting a most extraordinary passage, on the morning of July 5, 1809, from the island of Lobau to the n. bank, opposite Enzersdorf, landing 150,000 infantry, 30,000 cavalry, and 600 pieces of cannon before six in the morning. When the morning light showed the Austrians how they had been out-manuevered, they retreated across the plain of the March-field to its northern extremity, and took up a formidable position at Wagram, and being closely followed up, were, on the evening of July 5, attacked by a part of the French army. By the vigorous exertions of the archduke in person, the assailants—after a temporary success—were completely repulsed, and the Austrians, exulting in their second victory over Napoleon, waited in sanguine expectation the events of the next day. In the morning, the archduke resolved to assume the offensive, and succeeded at first in defeating the French center under Massena, and in forcing their left into inextricable confusion, followed by total rout; but at the same time his own left was turned by Davoust, and this success followed up by a successful attack of Macdonald on their center, forced the Austrians to retreat, which they did in the most orderly manner, carrying with them 5,000 prisoners, and leaving 25,000 dead or wounded on the field of battle—the French loss being about equal. This drawn battle (the archduke having, as Savary says, “in reality no reason for retiring”) had all the moral effects of a victory for the French; and was followed on July 11 by the armistice of Zürich, which resulted in the fourth treaty of Vienna.

WAGTAIL, *Motacilla*, a genus of birds of the family *motacillidae*, which is now very generally regarded as a sub-family (*motacillinae*) of *sylviae*, distinguished by a lengthened and slender bill, long and pointed wings, rather long and slightly curved claws, and a long narrow tail, which the bird incessantly wags up and down, with a jerking motion. The genus *motacilla* of Linnaeus included many of the *sylviae* not belonging to this group, as the red-breast, nightingale, black-cap, and blue bird. The genus *motacilla*, as now restricted, has a slender awi-shaped, straight bill; the nostrils oval, on the sides of the bill near the base, partly covered by a naked membrane; the wings of moderate size, the first quill-feather the longest, the second and third nearly as long as the first, the tertials very long; the tarsus much longer than the middle toe; the tail of twelve feathers, long, and nearly equal at the end.—The wagtails run with great celerity, and seek their food on the ground. Their food consists chiefly of insects and small seeds. They frequent the margins of rivers and lakes, inundated fields, and other moist grounds. “While the cows are feeding in moist low pastures,” says White (*Nat. Hist. of Selborne*), “broods of wagtails, white and gray, run round them, close up to their noses, and under their very bellies, availing themselves of the flies that settle on their legs, and probably finding worms and larvæ that are roused by the trampling of their feet.” Wagtails make their nests on the ground, among moist herbage, or in stony places. Their flight is rapid and undulatory. They are natives of the temperate regions of the old world. No species is found in America.

A common British species is the **PIED WAGTAIL** (*M. Yarrowi*), which is from 7 to 8 in. in length, the long tail included, and has prettily varied white and black plumage. It is abundant over the whole south of Europe, and is found there at all seasons of the year, which is the case also in the south of England; but in more northern regions it is only a summer visitant, as in the Orkney islands, where it is the first of the migratory birds to depart southward, the migration taking place almost as soon as the young are able for flight. The pied wagtail is incessantly in motion, jerking its tail, running quickly along the ground in quest of insects, and making short flights from place to place, chirping as it flies. It is often to be seen wading in shallow water, in pursuit of aquatic insects, and catching also small minnows when they approach the surface of the water. This species was long confounded with the **WHITE WAGTAIL** (*M. alba*), of the continent of Europe, common from Sweden to the Mediterranean, as also in many parts of Asia, and in elevated situations in India and the n. of Africa, but not a native of Britain. The two species are, however, very similar.—The **GRAY WAGTAIL** (*M. boarula*) is bluish gray above, with rump and lower parts yellow; a black patch on the throat in

summer. It is abundant on the continent of Europe, as well as in Britain, and is commonly seen on pastures, often in close attendance on cattle or sheep, whence the French name *bergeronette*, given to this and other species of wagtail of similar habits.—The YELLOW WAGTAIL (*M. flava*), and the GREEN-HEADED WAGTAIL (*M. Ruyi*), also British species, of which the latter is the more common, belonging to a sub-genus, by some regarded as a distinct genus, *budytes*, having the hind-claw very long and sharp, and thus approaching in character to the pipits (q.v.) or titlarks.

WAHA'BIS, or WAHA'BITES, a recent Mohammedan sect, now dominant throughout the greater part of Arabia. The movement may be considered a puritanic reform, which seeks to purge away the innovations and corruptions introduced in the course of ages, and to bring back the doctrines and observances of Islam to the literal precepts of the Koran and of the Sunna (q.v.), or oral instructions of Mohammed himself. This purified faith the Wahabis consider it their duty to impose at the point of the sword—in this, too, following strictly the precepts and practice of Mohammed and the first caliphs. The founder of the sect, Ibn-abd-ul-Wahab, was the son of an Arab sheik, or chief, and was born in Nejed or Nejd (the central highlands of Arabia), about the end of the 17th century. He is said to have visited various schools in the principal cities of the east, and to have lived some years in Damascus; and here he is represented as forming the resolution to restore in its primitive shape the ruined structure of Islam. Nor was the task an easy one. Throughout the Mohammedan world, the precepts of the Koran had fallen into abeyance, more especially among the Turks; and religion was little else than a round of external ceremonies—prayers, ablutions, fastings, the worshiping of the holy sheiks or saints at their tombs, and other superstitious innovations. In central and eastern Arabia where the faith of Mohammed had never taken deep root, matters were even worse. According to Palgrave, "almost every trace of Islam had long since vanished from Nejed, where the worship of the Djann (genii), under the spreading foliage of large trees, or in the cavernous recesses of Djebel Toweik, along with the invocation of the dead and sacrifices at their tombs, was blended with remnants of old Sabæan superstition, not without positive traces of the doctrines of Moseylemah and Kermut. The Koran was unread, the five daily prayers forgotten, and no one cared where Mecca lay, east or west, north or south; tithes, ablutions, and pilgrimages were things unheard of." Central Arabia was at that time divided among a multitude of virtually independent chiefs. One of these chiefs, named Sa'ud (or Saoud), a young man of ardent and capacious mind, who ruled over the small territory around the stronghold of Deraijeh, or Dureeyeh* (in Nejed), was the first important convert made by Ibn-abd-ul-Wahab after his return home; and the example of the prince was followed by his kindred and retinue. The Wahabi is said to have promised Sa'ud that if he would draw the sword in the cause of pure Islam, he would make him sole ruler of Nejed, and the first potentate in Arabia. The prophecy was fulfilled, partly in Sa'ud's reign, and fully in that of his son; and the Sa'ud dynasty is at this day the chief power in the peninsula, while the descendants of Ibn-abd-ul-Wahab (who lived till 1787) continue to act as spiritual directors, though without any acknowledged authority. It was about 1746 that Sa'ud began to act as apostle militant of the new, or rather revived Islam. One after another he subdued his heretical neighbors, offering them the alternative of conversion or extermination. Dying in 1765, he was succeeded by his son, Abd-ul-Aziz, who carried on the same policy with vigor and success. Extending his sway to Hasa (Al-Ahsa, as col. Pelly spells it, and anciently Ha'), and other places on the Persian gulf, he was brought in hostile contact with the Turkish authorities of Bagdad, and from that place an expedition was sent in 1797 against the Wahabis by way of Hasa; but it failed to penetrate into Nejed, and proved fruitless. The Wahabis now grew bolder in their plundering excursions toward the Euphrates, and in 1811, Sa'ud, the son of Abd-ul-Aziz, led an army against the holy city of Meshed Hussein, or Kербela, took it, massacred the greater part of the inhabitants, destroyed the tomb of Hussein, the grandson of Mohammed, and carried off the treasure. On this, a second Turkish army was sent from Bagdad against Nejed, but was routed, and the greater part slain. The conquest of Hejaz was next undertaken by the Wahabis. For two or three years, Ghaleb, the ruler of Mecca, had been more and more hemmed in by neighboring chiefs who had joined the Wahabis, and now, in 1803, Sa'ud collected a large army, and defeating Ghaleb in several battles, laid siege to Mecca, which, after a resistance of two or three months, surrendered at discretion. Not the slightest excess was committed, but the people had to become Wahabis—"that is, they were obliged to pray more punctually than usual, to lay aside and conceal their fine silk dresses, and to desist from smoking in public. Heaps of Persian pipes, collected from all the houses, were burned before Sa'ud's headquarters, and the sale of tobacco forbidden."—Burckhardt.

Failing to take Jiddah, into which Ghaleb had thrown himself, the Wahabi forces went northward, and, in 1804, took Medina, where they stripped the tomb of Mohammed of its accumulated treasures, and prohibited the approach to it of all but Wahabis, as they considered the reverence paid to it by the Turks and others as idolatrous. At

* Nothing is more perplexing than the orthography of Arabic proper names; every traveler spells them in a way of his own. In comparing Burckhardt, Palgrave, and col. Pelly, it is often difficult to identify the places and persons spoken about.

Medina, "the Wahabis enforced with great strictness the regular observance of prayers. The names of all the adult male inhabitants were called over in the mosque after morning, mid-day, and evening prayers, and those who did not obey the call were punished. A respectable woman, accused of having smoked the Persian pipe, was placed upon a jackass, with the pipe suspended from her neck, round which was twisted the long flexible tube or snake; in this state she was paraded through the town."—Burckhardt.

During these events, Abd-ul-Aziz had been assassinated, in the end of 1803, by a fanatical Persian, whose family had been murdered by the Wahabis at Meshed Hussein. He was succeeded by his son, Sa'ud II., who had for some time conducted the wars, and was perhaps the ablest ruler and warrior of the dynasty. For several years after the conquest of Hejaz, he continued to extend and consolidate his power. Plundering incursions were made to the very vicinity of Bagdad, Aleppo, and Damascus; while the Wahabi sheik of Asir (lying s. of Hejaz) imposed the new faith on a great part of Yemen. On the east, Sa'ud took the islands of Bahrein, annexed a part of the Persian coast on the e. side of the gulf, and exacted tribute from the sultan of Oman. This brought him into conflict with Great Britain, which sent (1808) a force, and severely chastised the Wahabi pirates that infested the commerce of the Persian gulf.

While these external struggles were going on, several of the southern provinces of Nejed broke out in revolt, instigated mainly, perhaps, by the local chiefs, whose power, formerly independent, was now circumscribed, or altogether taken away by the central government; but the rising was speedily suppressed, and a terrible example was made of the province of Harik and the town of Hulah, which last was completely demolished, and its inhabitants (the male inhabitants were reckoned at 10,000) butchered almost to a man.

From 1802, the Wahabis had prevented the great pilgrim caravans from reaching Mecca, both because they held the observances of the Turk and Persian hajjis to be idolatrous, and also because they were scandalized at the gross immorality and indecency which were openly practiced by these pilgrims. It may easily be conceived what horror spread through the Mohammedan world when it was told that the tomb of the prophet had been despoiled by heretics, who prevented the faithful from performing the most sacred duty of their religion. Accordingly, the sultan of Constantinople, the acknowledged protector of Mohammedanism, as early as 1804, imposed on Mehemet Ali, the newly appointed pasha of Egypt, the task of recovering the holy cities. With the dilatoriness, however, characteristic of the east, nothing was done till 1811, when an expedition was sent against them, under the command of the pasha's son, Tusin-bey. Medina was taken by the Egyptian forces in 1812, and Mecca in the following year; and a protracted and desultory warfare, with varying success, was kept up with the Wahabis in Hejaz and around its confines. At last, in 1815, Ibrahim pasha (q.v.) undertook to penetrate into central Arabia and crush the hornets in their nests. The enterprise was facilitated by the death of Sa'ud in 1814. He was succeeded by his son Abdallah, who, though an able warrior, was less adroit in securing unity of action among the numerous tribes under his sway. It was not, however, till 1818, and after repeated conflicts, that Ibrahim succeeded in decisively breaking the Wahabi force, and capturing their capital, Deraijeh, which was laid in ruins. Abdallah-ibn-Sa'ud was sent to Constantinople, where he and some of his ministers were beheaded (1818). Ibrahim continued some months in Arabia, consolidating his conquests throughout Nejed and the adjoining provinces. His policy was one of gentleness and conciliation toward the chiefs and common people, and of stern repression toward the fanatical religious teachers; and except among these, his name is said to be yet popular throughout central Arabia. But the folly and tyranny of the vice-governors whom he left, soon caused a general insurrection; the Egyptians had to retire to Kasim; and Turki, a son of Abdallah, was proclaimed sultan of Nejed, Riad being now chosen as the capital. Renewed expeditions were undertaken by the Egyptian commanders, driving, first, Turki from his capital for a time, and then his son and successor, Feysul; instead of whom, a chieftain favorable to Egyptian rule was appointed. But soon after the death of Mehemet Ali (1849), the Egyptians gave up the struggle; Feysul was recalled from exile; and under him and his son and vicegerent, Abdallah II., the Wahabi sway had become more powerful and extensive than ever. In 1870 Feysul was assassinated, and the dissensions between his two sons Abdallah and Sa'ud led to a civil war. This gave occasion to the Ottoman government to send a military force into the Persian gulf, which occupied Hofhuf, the capital of Hasa, but was unable to penetrate further into Nejed.

According to Burckhardt, there is not a single new precept in the Wahabi code. The only difference between the sect and the orthodox Turks (improperly so termed) is, "that the Wahabis rigidly follow the same laws which the others neglect, or have ceased altogether to observe. To describe, therefore, the Wahabi religion, would be to recapitulate the Mussulman faith; and to show in what points their sect differs from the Turks, would be to give a list of all the abuses of which the latter are guilty." One peculiarity of the Wahabis is their zeal against gaudy dress—silk and gold ornaments—and tobacco. In their wars of conversion, "No smoking" has been a kind of battle-cry. The recent traveler, Palgrave, who came into more intimate contact with the Wahabis than Burckhardt, has a much less favorable opinion both of their doctrines and their practice. He describes their empire as "a compact and well-organized government, where centraliza-

tion is fully understood, and effectually carried out, and whose mainsprings and connecting links are force and fanaticism. It is capable of frontier extension, and hence is dangerous to its neighbors, some of whom it is even now swallowing up. Incapable of true internal progress, hostile to commerce, unfavorable to arts and even to agriculture, and in the highest degree intolerant and aggressive, it can neither better itself nor benefit others; while the order and calm which it sometimes spreads over the lands of its conquest are described in the oft-cited *Ubi solitudinem faciunt, pacem appellant* of the Roman annalist. We may add, that its weakest point lies in family rivalries and feuds of succession, which, joined to the anti-Wahabian reaction existing far and wide throughout Arabia, may one day disintegrate and shatter the Nejedean empire, yet not destroy it altogether. But so long as Wahabiism shall prevail in the center and uplands of Arabia, small, indeed, are the hopes of civilization, advancement, and national prosperity for the Arab race." Col. Pelly characterizes the Wahabis as "Warlike Mohammedan Quakers."

Of late years the tenets of these puritans have taken root among the Mussulman population of India, and caused very considerable uneasiness.

The following statistical table of the Wahabian empire was drawn up by Palgrave, mostly from the official registers at Riad:

Provinces.	Towns or Villages.	Population.	Military Muster.
1. Aared.....	15	110,000	6,000
2. Yemamah.....	32	140,000	4,500
3. Harik.....	16	45,000	3,000
4. Atfaj.....	12	14,000	1,200
5. Wadi Dowasir.....	50	100,000	4,000
6. Seley'el.....	14	30,000	1,400
7. Woshem.....	20	80,000	4,000
8. Sedeyr.....	25	14,000	5,200
9. Kasim.....	60	300,000	11,000
10. Hasa.....	50	160,000	7,000
11. Katif.....	22	100,000	.....
Total.....	316	1,219,000	47,300

The Bedouin populations within the territories number upward of 70,000. A good many of the towns are large, and populous to a degree that the current notions of central Arabia would hardly lead us to look for. The following are among those of which Palgrave estimates the population: Eyun, 10,000; Bereydah, 25,000; Oneyzah, 30,000; Toweym, 12,000-15,000; Horeymelah, 10,000; Mejmaa', 10,000-12,000; Riad, the capital (which col. Pelly has ascertained to be in lat. 24° 38' 34", long. 46° 41' 48"), has probably about 40,000; Kharfah, 8,000; Hofhuf (Al-Hufhuf), 24,000. Katif (Khutif) is the most direct port of the Wahabian dominions; and the province of Hasa in which it is situated is the richest.

To the n. of Nejed and its dependencies lies a kingdom formerly ruled over by a half-hearted ally of Feysul's, Telal, the chief of Djebel Shomer, and consisting of five provinces—Djebel Shomer, Djowf, Kheybar, Upper Kasim, Teymar—with a settled pop. of 274,000, and 166,000 Bedouins. Hayel, the capital, has a pop. of 22,000. This part of Arabia was overrun and converted during the first outbreak of Wahabi propagandism; but the conversion was only seeming, and during the interference of Egypt in Arabian matters the country regained a kind of independency. Since the death of Telal, Ottoman interference has been attempted. The great majority of the people are averse to Wahabiism. Still, the Wahabis have numerous partisans and missionaries and spies in all the towns, and their influence is hated and feared by prince and people. Even Oman, where the new Islam is said to be still more distasteful, has been brought in some degree under the political sway of the Wahabis, and pays a small yearly tribute.

Karsten Niebuhr (q.v.) is the first European writer who mentions the Wahabis; Burckhardt, *Notes on the Bedouins and Wahabis* (1830), gives a sketch of the Wahabi doctrines and of their history down to 1815; sir Harford Jones Brydges, for many years resident at Bagdad, to his *Account of the Transactions of His Majesty's Mission to the Court of Persia*, appends a "Brief History of the Wahauby;" Mengin, *Histoire de l'Egypt sous le Gouvernement de Mohammed Ali*; Corancez, *Histoire des Wahabis*, with maps. The most recent authorities on the subject are W. G. Palgrave's *Narrative of a Year's Journey through Central and Eastern Arabia*, 1862-63 (Macmillan & Co., 1865); and "A Visit to the Wahabee Capital," by lieut.col. L. Pelly, H.M. political resident, Persian gulf, in *Geog. Soc. Journal*, 1865.

WAHKIAK'UM, a co. in s.w. Washington territory, having the Columbia river for its s. boundary; 255 sq.m.; pop. '80, 1,600—702 of American birth, 616 colored. Co. seat, Cathlamet.

WAHOO. See ELM.

WAIBLINGEN, a t. of Würtemberg, on the Rems, in the circle of the Neckar; pop. '75, 4,128. It usually gets the credit of having given to the family of the Hohenstaufen

the title which became Italianized into Ghibellines (see GUELPHS AND Ghibellines); but Raumer (q.v.), the historian of the Hohenstaufen dynasty, upholds the claim of another Waiblingen in Württemberg, on the Kocher, in the circle of Jaxt.

WAIFS, in English law, are goods stolen, and waived or abandoned by the felon on being pursued. The goods belong to the crown, but the owner, on doing diligence to prosecute and convict the thief, can have them again,

WAINSCOT (Sax. *wag*, a wall, and *scot* or *schot*, corresponding to Ger. *scheit*, a split or cut piece of timber—from *scheiden*, to divide; the word would thus mean wall-timber or boards), the name given to boards lining the interior walls of apartments. Such lining, usually in panels, is very common in Elizabethan architecture. The name is frequently applied to the best kinds of oak boards, from oak having been so much used for paneling.

WAINWRIGHT, JONATHAN MAYHEW, D.D., D.C.L., 1792–1854; b. England; of American parentage; came to this country, 1803, and graduated at Harvard college, 1812; became rector of Christ church, Hartford, Conn., 1816; assistant minister of Trinity church, New York, 1819; rector of Grace church, 1821; of Trinity church, Boston, 1834; took charge of St. John's chapel, Trinity parish, New York, 1837; visited Europe and the east, 1848–49, and Europe a second time, 1852, when he received from Oxford the degree of D.C.L.; elected provisional bishop of the diocese of New York, and consecrated in Oct., 1852. Among his published writings are: *There cannot be a Church without a Bishop*—a controversy with rev. Dr. Potts; and *The Pathways and Abiding-Places of our Lord*.

WAIST, in a ship, is that portion of the upper deck lying between the fore and main masts. In it the larger boats are stowed, and along its gunwale the crew pile their hammocks during the day. In a steamer the waist is much broken into by the engine room.

WAITE, HENRY RANDALL, Ph.D., b. N. Y., 1846; graduated at Hamilton college, 1868; studied at Union theological seminary (Presbyterian), New York; resided in Europe, 1871–74, organizing American chapels at Rome and Geneva, and being chaplain at Rome; became editor of *Daily Evening Journal* at New Haven, 1874; associate editor of *International Review* at New York; lecturer on political science in the Syracuse university; and president of the political science association and of the national reform league, both of which were organized by his efforts. He has published *Sermons from the life of St. Paul at Rome*, and is writing other works.

WAITE, MORRISON REMICK, LL.D., b. Lyme, Conn., 1816; graduated at Yale college, 1837, a classmate of William M. Evarts and Edwards Pierrepont; studied law at Lyme, and after his admission to the bar moved to Ohio, where he practiced successfully in Maumee City and Toledo. In 1849 he served in the state legislature, but after that, though frequently offered political and judicial positions, declined all nominations and built up a large practice in the higher branches of the law. In 1871 he was one of the counsel for the United States in the Geneva arbitration on the *Alabama* claims. He was president of the constitutional convention of Ohio, 1873, and in March of the next year was nominated as chief-justice of the United States by president Grant, and confirmed by the senate.

WAITS (anciently spelled *waightes*) is a name which has, at successive periods of our history, been given to different classes of musical watchmen. The word is one, in slightly varied forms, common in the sense of guard or watchman to all the Germanic languages. It is the German *wacht* or *wache*, Dutch *wagt*, Danish *vaght*, Swedish *wakt*, Scotch *waite*, and the English *watch*. How the word in the form of waits came to be exclusively applied to musical watchmen in England and Scotland, it is impossible to say. In the time of Edward IV. the waits appeared to have formed a distinct class from both the watch and the minstrels. It was their duty, we learn from Rymer's *Federa*, to pipe the watch nightly in the king's court from Michaelmas to Shrove Thursday four times, in the summer nights three times, and to make "the bon gayte" at every chamber door and office, for fear of pykeres and pillers. The waits were not confined to the court; there were musical watchmen at an early period in many provincial towns. In Exeter a regular company existed in 1400. Beaumont and Fletcher (*Knight of the Burning Pestle*) speak of the "waits of Southwark as rare fellows as any in England." The word in the provinces was afterward sometimes applied to the town musicians, who may have represented the old waits, but who had no duties to perform as watchmen. The name was also given to the town band, or to private musicians when employed as serenaders. In this sense it is used in the *Tidder* (No. 222). The writer says that it had become so much the custom for lovers to employ the waits to help them through their courtship in Nottingham, that the ladies of that place could get no sleep by reason of riotous lovers who infested the streets with violins and bass-voles between 12 o'clock and 4 in the morning. Till recently the waits were officially recognized in London and Westminster. In London the post of leader of the waits was purchased; in Westminster the appointment was in the gift of the high constable and court of burgesses. In 1820 a Mr. Munro obtained the post of official leader of the waits for Westminster, with the exclusive right to serenade the inhabitants, and make application for Christmas-boxes. His prerogatives were invaded by other musicians, and he prosecuted several persons before the police courts. At present, in the metropolis, the waits are musicians who play during the night or early in the morning for two or three weeks before Christmas.

They call afterward at the houses of the inhabitants to ask for a Christmas-box. In Glasgow there were waits at an early period. The magistrates still grant a certificate to a few musicians, generally blind men, who play in the streets during the night and morning for about three weeks previous to New Year's day. Like the London waits, they call at the houses of the inhabitants, show their credentials, and ask a small subscription.—See Chambers's *Book of Days*, vol. ii. p. 742.

WAITZEN, a t. of Hungary charmingly situated among vineyards, on the left bank of the Danube, 21 m. n. of Pesth, on the Vienna and Pesth railway. It is a bishop's see, contains a noble cathedral with conspicuous dome, built in 1777, and a handsome episcopal palace. Considerable wine-culture is carried on, and there are important cattle-markets. Pop. '69, 12,894.

WAIVER, in law, the neglect or refusal of a person to take advantage of his right. Every person must claim the exercise of his rights at the proper moment; his neglect or relinquishment will be regarded as a waiver. A party bringing suit against another may sometimes waive one remedy and pursue another.

WAKE (from the Anglo-Saxon *wacian*, to watch) is the English equivalent of the ecclesiastical vigil (q.v.). In early times, the day was considered as beginning and ending at sunset; Sundays and holidays, in consequence, began not on the morning, but on the previous evening (the *eve* of the holiday), and worshipers then repaired to the churches for worship. The following day was spent in amusement. Each church when consecrated was dedicated to a saint, and on the anniversary of that day was kept the parish wake. In many places, there was a second wake on the birthday of the saint. On these occasions, the floor of the church was strewn with rushes and flowers, and the altar and pulpit were decked with boughs and leaves. In the churchyard, tents were erected to supply cakes and ale for the use of the crowd on the morrow, which was kept as a holiday. The second part of the festival seems to have made most impression on the popular mind, and the word wake came to be applied to it. Crowds resorted to the wakes from neighboring parishes, hawkers or merchants were attracted by the crowds, and ultimately they became mere fairs or markets, little under the influence of the church, and disgraced by scenes of indulgence and riot. In 1285, Edward I. passed a statute which forbade fairs and markets to be held in country churchyards; but it does not appear to have put an end to the evil. In 1448 Henry VI. ordained that all showing of goods and merchandise, except necessary victuals, should be discontinued on the great festivals of the church. These regulations do not seem to have been strictly enforced. An act of convocation passed in 1536, during the reign of Henry VIII., seems to have effected a more important change. It ordered the day of the dedication of the church to be kept in all parishes on the first Sunday in October, and gradually that festival ceased to be observed. The saint's-day festivals were not, however, affected, and they are still kept in many English parishes under the name of "country wakes." A *lyke wake* or *liche-wake* is a watching of a dead body (A.-S. *lic*) all night by the friends and neighbors of the deceased. The custom no doubt originated in superstitious fear either of passing the night alone with a dead body, or of its being interfered with by evil spirits. It must at all times have led to scenes ill suited to the occasion, and it now survives only among the lower classes in Ireland.—See Brand's *Popular Antiquities*, by Ellis.

WAKE, a co. in central North Carolina; 900 sq.m.; pop. '80, 48,209—47,949 of American birth, 23,315 colored. It is the most populous county in the state. Co. seat, Raleigh; capital of the state.

WAKE, WILLIAM, D.D., 1657–1737; b. England; graduated, Oxford, 1676; accompanied viscount Preston as chaplain to the English embassy to France; returning was elected preacher to Gray's inn; had a long theological controversy with Bossuet; canon of Christ church, 1689; rector of St. James, Westminster, 1693; dean of Exeter, 1701; bishop of Lincoln, 1705; archbishop of Cambridge, 1716. He published a translation of *Apostolic Fathers*; three volumes of *Sermons*. He bequeathed his library and collection of coins, valued at £10,000, to Christ church-college, Oxford.

WAKEFIELD, an important and handsome t. in the West Riding of Yorkshire, overlooking the Calder, 9 m. s. of Leeds, on the Lancashire and Yorkshire railway. The town consists of three principal and many minor streets, and among the chief buildings are the parish church, conspicuous from its lofty and elegant spire; the grammar-school, a wealthy institution, attached to which there are six exhibitions to the universities; the library and news-rooms, corn exchange, etc. Its benevolent and scientific institutions are numerous and important. The town has long been famous for its manufactures of woolen yarn and cloths. The district around Wakefield is agricultural, and the town is noted for its corn and cattle markets. Coal-mines are worked in the vicinity. Wakefield returns one member to the house of commons. Pop. '71, 28,069.

WAKEFIELD, EDWARD GIBBON, 1796–1862; b. England; became a land-surveyor. In 1826 he was imprisoned in Newgate on a conviction for forcibly abducting an heiress—with whom he went through a "Gretna Green" marriage, declared void by act of parliament. His three years' imprisonment furnished him material for a work on prison management. He subsequently resided in Australia, France, and New Zealand; intro-

duced the "Wakefield colonization system," somewhat resembling the pre-emption plan of the United States; took part in abolishing penal transportation; and wrote *A View of the Art of Colonization*, and other treatises on social and political questions. He died in New Zealand.

WAKEFIELD, ROBERT, 1480-1537; b. England; educated at Cambridge and on the continent; taught Greek, Hebrew, Chaldaic, and Syriac in France and Germany; prof. of Hebrew at the university of Louvain, 1519; returning to England became king's chaplain; advised Henry VIII. in regard to his divorce from Catharine of Aragon; lecturer in Greek at Cambridge, 1524; prof. of Hebrew at Oxford, 1530; canon of Wolsey's new college, 1532. He published various books, and was pronounced the greatest linguist of his time.

WAKE-ROBIN. See **ARUM**, *ante*.

WAKULLA, a co. in n. Florida, having Appalachee bay and the gulf of Mexico on the s.e.; about 600 sq.m.; pop. '80, 2,723-2,712 of American birth, 1160 colored. Co. seat, Crawfordville.

WALACHIA. See **MOLDAVIA**.

WALBRIDGE, HIRAM, 1821-70; b. Ithaca, N. Y.; graduate of Ohio university, 1841; studied law in Toledo, O.; admitted to the bar, 1843; brig.gen. of Ohio militia, 1844; engaged in business in New York in 1847. He was a democrat in politics; member of congress, 1853-55; opposed the rebellion, declined a seat in president Lincoln's cabinet, but worked sedulously for the commercial interests of the country. He was on the Pacific railroad committee, 1869, and took a prominent part in the national commercial conventions at Chicago, Detroit, and Louisville.

WALCHEREN, an island in the Netherlands province of Zeeland, at the mouth of the Scheldt, contains 52,000 acres; pop. '75, 42,503. The chief places are Middleburg, Flushing, and Vere or Campvere (q.v.). One-half is meadow, the other rich arable land, well wooded to the north. Where it is not protected by natural downs, strong dikes have been formed, that at West Kappella being a magnificent work. The drainage water is carried off by large sea-sluzes at Middleburg and Vere. Agriculture is the principal employment. Ship building, beer-brewing, rope-spinning, weaving, sawing wood, grinding corn, tanning leather, etc., are carried on, especially at Middleburg and Flushing. From the latter town, a railway has been constructed through w. and s. Beveland to Bergen-op-Zoom, joining the other continental lines. Flushing has a considerable shipping trade. The people are chiefly Protestants. In many parts are large artificial mounds, supposed to have been erected by the early inhabitants as places of refuge from high tides.

WALCHEREN EXPEDITION, one of the most disastrous military failures in the history of modern warfare, was undertaken, like that of sir John Moore to Spain, with the view of helping the continental allies of Britain, by creating such a diversion as would prevent the concentration of Napoleon's strength, in overwhelming amount, against any one of his opponents. The expedition was planned in 1807, when Prussia, Russia, and Austria were all in arms against France; but it was not till early in the summer of 1809 (when Napoleon, who had meantime overwhelmed Prussia, and reduced Russia to neutrality, was gradually forcing Austria to succumb) that the British ministry resolved to carry it out. The plan was to send a fleet and army up the Scheldt and attack Antwerp (the principal naval station and arsenal in the n. of France), whose fortifications, though formidable, were much in need of repair, and whose garrison at the time only numbered about 2,000 invalids and coast-guards; while there were not more than 10,000 French soldiers in Holland. The expedition, after numberless needless delays, at last sailed on July 28; and, to the number of 37 men-of-war, 23 frigates, 115 sloops and gun-boats, accompanied by transports, carrying about 41,000 soldiers, reached the Dutch coast on the following day. But, instead of obeying the orders of the minister of war, lord Castlereagh, to *advance at once in force against Antwerp*, the commander-in-chief, lord Chatham (the elder brother of Pitt), frittered away his time in the reduction of Vlissingen (Flushing), which was not effected till Aug. 16, by which time the garrison of Antwerp had been re-enforced by king Louis Bonaparte with the troops at his command (about 6,000), and by detachments sent from France, which swelled the garrison, by Aug. 20, to 15,000 men. About the end of August, Chatham, who, as a general, was a methodical incapable, "found himself prepared" to march upon Antwerp, but by this time 30,000 men, under Bernadotte, were gathered to its defense, and the English army was decimated by marsh-fever, so that success was not to be hoped for. However, it was judged right to hold possession of Walcheren, in order to compel the French to keep a strong force on the watch in Belgium, and, accordingly, 15,000 men remained to garrison the island, the rest returning to England; but the malaria proved too fatal in its ravages, and as peace had been concluded between Austria and France, this force was also recalled. Thus an excellently devised scheme, through the utter stupidity of the agent chosen by royalty to carry it out, failed in every point of consequence, and ended in a loss of 7,000 men dead, and the permanent disablement of half the remainder. The failure of the Walcheren expedition

was made the occasion of furious onslaughts on the ministry in the house of commons and in the public journals.

WALDECK-PYRMONT, formerly a sovereign principality in the n.w. of Germany, consisting of the old co. of Waldeck, inclosed between Westphalia, Hesse-Cassel, and Prussia, and the small co. of Pyrmont, about 30 m. n. of Waldeck. The form of government was a constitutional and hereditary monarchy; but since 1868 the administration has been under the control of Prussia, by which power a lieutenant-governor (landes director) is appointed. The entire area was 432 sq. miles. Pop. '75, 54,743. The elevation of the country is greater than that of most districts of Northern Germany; and the scenery, continually alternating between mountain and valley, forest and plain, comprises scenes of much natural beauty. The two largest rivers are the Eder and Diemel, affluents of the Weser. Among the minerals found are gold, copper, iron, and lead; and mineral springs occur. Agriculture and cattle-breeding are by far the most common pursuits of the people, and with the exception of leather, no articles are manufactured to any extent. An important article of export, and one from which the prince derives a considerable portion of his revenue, is the mineral water of the Pyrmont spa.

The noble house of Waldeck, one of the oldest in Germany, formerly owned, besides their present possessions, the counties of Swalenburg and Sternberg, but lost the former in 1356, and the latter in 1399. Chief town, Arolsen, with (1875) 2,460 inhabitants.

WALDENSES (VALDENSES, VALDESI, VALESI, VAUDOIS), are a Christian community who inhabit a mountain tract on the Italian side of the Cottian Alps, s.w. from Turin. The district is bounded on the n. by the Dora Riparia, on the s. by the Po. It is inclosed on all sides by the spurs of the Alps, which divide it into three valleys—that of Perosa, drained by the Clusone; that of San Martino, drained by the Germanasca; and that of Lucerna, drained by the Pelice, all tributaries of the Po. These valleys lie between France and Italy, and immediately s. of the great western route into Italy by the passes of Mont Cenis and Genevre. The inhabitants are thus brought into communication with both countries; indeed, they speak a dialect more closely allied to those of Dauphiné than to those of Piedmont; and they have used French as well as Italian as the language of their liturgy. The religious doctrines of the Waldenses are now similar to those of the Reformed churches. There is a minister in each parish, called a *barbe*, and the synod is presided over by an elected *moderator*. The Waldenses had at one time bishops, but that was when the sect was more widely spread than it now is. Much has been said of the origin of the Waldenses. Their own historians assert that the community has remained from apostolic times independent of the church of Rome, and boast that they can show a regular apostolic succession of bishops from the earliest period of Christianity till that of the reformation. This statement has been very generally admitted by uncritical writers, but in the light of recent investigations, would seem to be no longer tenable. Dieckhoff (*Die Waldenser im Mittelalter*, Gött. 1851) and Herzog (*Die romanischen Waldenser*, Halle, 1853), have submitted the early history of the Waldenses to a critical examination; and the result to which they have come, after an examination of the manuscript records, is, that the Waldenses had not the early origin claimed for them, and were not Protestants before the reformation, although they entertained some opinions which, so far, were in anticipation of those held by the reformers. They are also of the opinion that the Waldenses do not take their name from *val*, *vallis*, a valley, as has been assumed, but from Peter Waldo of Lyon, a merchant of the 12th c., who was less the founder of a sect than the representative and leader of a wide-spread struggle against the corruptions of the clergy. The church would have tolerated Peter Waldo, as it had tolerated St. Francis of Assisi, the founder of the Franciscans, and perhaps have allowed him to form a new order, had he not trenchanted upon ground dangerous to the hierarchy. But he had the four gospels translated, and maintained that laymen had a right to read them to the people. He exposed in this way the prevalent ignorance and immorality of the clergy, and brought down their wrath upon himself. His opinions were condemned by a general council in 1179, and he retired to the valleys of the Cottian Alps. A long series of persecutions followed, but Waldo's followers could not be forced to abandon their opinions. They continued to be known as the *Leonisti*, from the place of their origin—the poor people of Lyons, from their voluntary penury—*Sabotati*, from the wooden shoes they wore—and *Humilitati*, on account of their humility. It was natural that a body cruelly persecuted should stand aloof from the church, and even offer armed resistance; yet we have no evidence of the manner in which the Waldenses first became a separate community. They are now shown to have been identical with the followers of Waldo, but they must not be confounded with the Albigenses, who were persecuted at the same period. The protest of the Waldenses against the church of Rome only related to practical questions, that of the Albigenses related to matters of doctrine.

The Waldenses at first seem to have spread in the upper valleys of Dauphiné and Piedmont, to which Waldo retired. They were subjected to persecutions in 1332, 1400, and 1478, and driven into many parts of Europe, where their industry and integrity were universally remarked. So widely had the sect been scattered, that it was said a traveler from Antwerp to Rome could sleep every night at the house of one of the brethren. In Bohemia many of them had settled, and they, without forsaking their own community,

joined the Hussites, Taborites, and Bohemian brethren—a connection which led to a change in the principles of the Waldenses. They adopted the doctrines of the reformers, and this led to more serious persecutions than any they had previously undergone. Francis I. of France, in possession of Piedmont in 1541, ordered them to be extirpated. They were massacred at various places in Dauphiné and in the valleys they still occupy, more especially at Merindol and Cabrière. Several persons who refused to abandon their faith were burned alive, yet the sect continued to exist. In 1560 the duke of Savoy, who had recovered possession of Piedmont, urged by pope Paul IV., forbade the Waldenses to exercise their faith, under the penalty of being sent to the galleys for life. The Waldenses sent him a petition and apology for their creed, which appeared to him so plausible, that he suggested that a conference should take place between the Waldensian and Romanist divines. He was, of course, told that the proposition was monstrous, and bullied by the pope and the courts of Spain and France so effectually, that he dispatched 7,000 men into the valleys, who were joined by two French regiments. The Waldenses offered a gallant resistance, but were overwhelmed by superior force. Many prisoners were burned alive, and women and children were ruthlessly slaughtered. The duke was disgusted with these atrocities, and although denounced as no better than a heretic at Rome, granted the Waldenses an amnesty on condition that their service should only be performed at certain places in the valleys of Lucerna and San Martino. The Waldenses in the other districts, and especially the marquise of Saluzzo, were then persecuted by the Jesuits. Charles I. of England sent two embassies to the duke of Savoy to intercede in their behalf, but without avail. Victor Amadus I., not long after, ordered the Waldenses of Saluzzo, under the penalty of confiscation of property and death, to become Catholics; and the edict was so rigorously carried out that, in a few years, none of the sect remained in the district. Charles Emmanuel II., in 1655, directed a fresh persecution against the Waldenses. Some time before, the people of Lucerna, inflamed, it is said, by the discourses of Jean Leger, a popular preacher, set fire to a convent of Capuchins, and committed other excesses. An inquiry was made, and it was found that the Waldenses had purchased property and built churches and schools in districts where no concessions had been granted them. They were ordered within 20 days to sell their property, or profess Catholicism. They resisted, under leaders named Jayer and Janavel, but they could not oppose the forces sent against them. No quarter was shown to women and children, and atrocities were committed—more especially by the French and Irish mercenaries in the service of the duke—which, recorded by Jean Leger, were heard of with indignation in all Protestant countries. Subscriptions were made in England for those who had survived the massacre. The Swiss cantons, and the states of Holland, sent envoys to the duke. Cromwell addressed Latin letters to him, written by Milton, and also sent sir Samuel Morland, who collected numerous manuscripts connected with the history of the Waldenses, and brought them to England with him. A convention was concluded, by which the Waldenses were allowed again to exercise their worship. In 1685 Louis XIV. revoked the edict of Nantes, and ordered the duke of Savoy to compel the Waldenses to adopt Catholicism. They were accordingly commanded to emigrate or abjure their tenets within 15 days. They resisted, and were attacked by the troops of the duke on one side, and those of Louis XIV. on the other. They were overpowered, and the survivors could make no conditions. A large number were imprisoned at Turin, where many died; others were allowed to emigrate. Their whole property was confiscated, and handed over to Roman Catholic colonists. When the prince of Orange became king of England, the Waldenses who had settled in Switzerland resolved to return to their valleys under the guidance of Henry Arnaud, one of their pastors. In 1689 they gathered from all quarters to the rendezvous in the great forest of the Pays de Vaud. On the night of Aug. 16, they embarked on the lake of Geneva, landed on the opposite shore, and after encountering the most determined opposition, reached the valley of San Martino, after a perilous march of 31 days. During the winter a French army of 22,000 men entered their territories, and in the following summer attacked their fortifications, but were repulsed with great slaughter. Fortunately, the French and Piedmontese at this juncture quarrelled, and the latter, to secure the services of the mountaineers, granted them an amnesty. They are said to have fought not less than 18 battles against the French, and to have lost only 30 men. This was the last persecution against the Vauds; but it was not till 1848 that they were put on a level with their Catholic fellow-subjects. They had then 18 pastors and 15 congregations; in 1879 there were 56 regular Waldensian congregations (with 14,600 communicants), beside 24 "missionary stations" in various parts of Italy, as at Turin and Rome. The *Libera Chiesa*, a Protestant Italian church, is not connected with the church of the Valleys. The Waldenses have a college at Florence, and publish several denominational and missionary journals. See the works of Botta, Bender, Morland, Gelly Muston.

WALDO, a co. in s. Maine, having the Penobscot river on the e., the Penobscot and Belfast bays on the s.e.; 800 sq. m.; pop. '80, 32,468—31,843 of American birth, 24 colored. It has a large export trade and important manufactures. Co. seat, Belfast.

WALDO, DANIEL, 1762—1864; b. Conn.; a soldier in the revolutionary war; taken prisoner at Horse-neck, and confined in the sugar-house, New York, where he was treated.

with great cruelty; graduated at Yale college, 1788; pastor of the Congregational church at West Suffolk, Conn., 1792-1809; missionary in Pennsylvania and New York; settled at Cambridgeport and Harvard, Mass.; at Exeter, R. I., for 12 years; chaplain to the U. S. house of representatives, 1855, at the age of 93. He died at the age of 102.

WALDO, PETER. See WALDENSES, *ante*.

WALDO, SAMUEL, 1783-1861; b. Conn.; studied at Hartford, and afterward at London, where he was the friend of Copley and West, and gained some reputation as a portrait painter. He returned to New York in 1809, and continued the practice of his profession there till his death.

WALDOBOROUGH, a t. and port of entry, Lincoln co., s.w. Maine; incorporated, 1773; first settled, 1748, by Samuel Waldo, who obtained from George II. the Waldo patent; pop. '80, 3,759. It is 50 m. from Portland, 19 m. w. of Rockland on Muscongus bay, at the mouth of the Muscongus river, 15 m. from the sea. It has a station on the Knox and Lincoln railroad. Several islands in the bay are included in its limits. It is built on a hilly surface having pleasant sheltered valleys, and has an important coasting trade. It contains a custom-house, 2 national banks, a library, a newspaper, and 6 churches. Among the industries are ship-building, the manufacture of wool, carriages, bricks, earthenware, etc.

WALES. See the articles ENGLAND, GREAT BRITAIN, PRINCE OF WALES, and the names of the various counties, towns, etc., of the principality; also WELSH LANGUAGE AND LITERATURE.

WALES, NEW SOUTH. See NEW SOUTH WALES.

WALEWSKI, ALEXANDRE FLORIAN JOSEPH COLONNA, Count and Duke, 1810-68; b. Poland; reputed son of Napoleon I. by a Polish lady; educated at Geneva; fought in the Polish army; went to France after the fall of Warsaw, 1830; entered the army and was made capt.; relinquished military life and devoted himself to politics and literature; was sent to Egypt by M. Thiers on a diplomatic mission; received appointments under the Guizot ministry; was *chargé d'affaires* to Buenos Ayres at the outbreak of the revolution, 1848; was sent by Louis Napoleon ambassador to Florence, 1849; to London, 1854; minister of state, 1860-63; president of legislative assembly, 1865-67; was editor of the *Messenger*, and published *Un mot sur la question d'Afrique*; *L'alliance Anglaise*.

WALHALLA (the hall of the fallen, i.e., heroes. See WALKYRIES.), is, in northern mythology, the name of the place of residence for the fallen in battle. This brilliant hall stood in Gladheim (the house of joy); in front of it was the beautiful grove Glasur, the trees of which bore golden leaves. Before the hall, which was so high that its summit could scarcely be seen, a wolf was hung, as a symbol of war, over which sat an eagle; the saloon itself, ornamented with shields, and wainscoted with spears, had 540 doors, through each of which 800 of the inmates (Einherjer) could walk abreast. For these Einherjer (i.e., the brave), who came after death to Odin, was it destined. Renowned chiefs, especially if they had desolated many countries, and wielded the blood-dripping sword far and wide, were met and welcomed by Bragi and Hermode as messengers from Odin. The hall was decorated to honor them; all the divine heroes stood up at their reception; the Walkyries tasted wine for them, which otherwise only Odin drank. All kings came to Walhalla, even when they did not die on the battle-field; in general, these joys seem to have been prepared only for those of high rank and the rich. As it was honorable to come to Walhalla with a great retinue, and to possess many treasures, the comrades of a leader who had fallen in battle killed themselves of their own free will, and in his grave were laid along with his horse and arms the treasures won in fight. Every morning the inmates marched out at the crowing of the cock, and fought furiously with another; but at midday all wounds healed, and the heroes assembled to the feast under Odin's presidency. Odin himself partook of nothing but wine; he gave the edibles to the *völves* Geri and Freki, who sat beside him. The guests ate of the bacon of the boar Sahrimmer, and refreshed themselves with beer and mead, which flowed in abundance from the udder of the goat Heidrun; the attendant Walkyries handed them the drinking-horns, under Freyja's direction. Occasionally, the hero rode by night to his grave, where the beloved Walkyrie received him; he reposed in her embrace till, night disappearing, he exclaimed, "It is time to make the horse tread on the white stair of the sky; I must travel toward the west to the bridge of heaven before the cock awakes the warriors in Walhalla." The half of the fallen belonged to Freyja. The boar Sahrimmer, of which the heroes ate, was prepared by the cook Andhrimmer in the kettle Eldhrimmer. *Sa* is explained as signifying water; *and*, breath or soul; *eld*, fire; *hrim*, i.e., frost, was the primitive matter of which the world was made; for the branches of the deer Eikthyrnir, standing over Walhalla, drops fell into the well Hvergelmer, from which all rivers flowed. According to this, the heroes appear to be conceived as stars or spirits of the constellations, which draw their nourishment from the elements; and Walhalla stands for heaven.

The name WALHALLA is also given to a magnificent structure erected by Ludwig I. of Bavaria (1830-41) as a temple of fame for all Germany. He conceived the project in 1806, when the fatherland was at its lowest point of degradation, and while he was yet crown-prince. The design of the building was by Klenze, and the chief sculptors of

Germany have contributed to the execution of the plan. It stands on an eminence 250 ft. above the Danube at Donaustauf, near Regensburg. The temple is of nearly the same dimensions and proportions as the Parthenon, and is built of marble. By means of statues, busts, reliefs, and tablets, the mythology and history of Germany are illustrated, and her greatest names commemorated. The undertaking cost 2,330,000 florins.

WALKER, HENRY, b. Virginia, 1809; entered the navy as midshipman, 1839. He took part in the capture of Tobasco, Vera Cruz, and Tuspan in the Mexican war, and ranked as commander at the beginning of the war of the rebellion. He held commands at the battles of Fort Henry, Fort Donelson, Island No. 10, Fort Pillow, the passage of the Vicksburg batteries, and other engagements; becoming a commodore in 1866, and rear-admiral on the retired list, 1871.

WALKER, a co. in n.w. Alabama, drained by the Black Warrior river and its affluents; 950 sq.m.; pop. '80, 9,323—9,295 of American birth, 489 colored. Co. seat, Jasper.

WALKER, a co. in n.w. Georgia; about 600 sq.m.; pop. '80, 11,056—11,013 of American birth, 1564 colored. It contains Lookout mountain and the famous battlefield of Missionary Ridge. Co. seat, Lafayette.

WALKER, a co. in e. Texas, drained by the Trinity and San Jacinto rivers; 700 sq.m.; pop. '80, 12,840—12,442 of American birth, 7,410 colored. Co. seat, Huntsville.

WALKER, AMASA, LL.D., 1799—1875; b. Conn., was a merchant in Boston, 1825—40, and a prominent abolitionist; a delegate to the international peace conventions held in Europe, 1843 and 1849; a member of the Massachusetts legislature, 1848; a state senator, 1849; secretary of state, 1851—52; a member of the constitutional convention, 1853; and a member of congress, 1862—63; professor of political economy at Oberlin, 1842—49; and lecturer at Amherst, 1861—75. He published *Nature and Uses of Money and Mixed Currency*; *Science of Wealth*; a *Manual of Political Economy*; and, in connection with others, *Transactions of the Agricultural Societies of Massachusetts*, 7 vols.

WALKER, BENJAMIN, 1753—1818; received a business education; was a capt. in the 2d. N. Y. regiment; served as aid-de-camp to Stenben, and to Washington, 1781—82; secretary to the governor of New York after the revolutionary war; subsequently a broker in New York city. He was naval officer of New York under president Washington; member of congress, 1801—3. He was identified with the early settlement of Utica, N. Y., holding the position in 1797 of agent to the immense estates of the earl of Bute.

WALKER, FRANCIS AMASA, b. Boston, 1840; served in the war of the rebellion and was made brevet brig.gen., 1865; chief of bureau of statistics at Washington, 1869; superintendent of the census of 1870 and 1880; Indian commissioner, 1871; professor of political economy and history in the Sheffield scientific school of Yale college, 1872—81; and has been elected president of the Massachusetts school of technology at Boston, to assume the office in Oct., 1881. Besides the census reports, he has published *The Indian Question*; *The Wages Question*; and the *Statistical Atlas of the United States*.

WALKER, REV. GEORGE, an Irish clergyman, distinguished for the part he took in the heroic defense of Londonderry against the army of James II., was born in the county of Tyrone, of English parents, in the early part of the 17th century. He was educated at the university of Glasgow, and, entering the church, became rector of Donoughmore. The early life of Walker was not remarkable. When the Irish army of James II. entered Ulster, and took possession of Kilmore and Coleraine, Walker sought refuge in Londonderry, the headquarters of "the Englishry" since the times of James I., when the confiscated lands of the county had been bestowed on the corporation of the city of London, and a Saxon colony, English and Scotch, had been planted there, who had converted a waste into the richest district of Ireland. The town was fortified sufficiently to protect it from the pike-armed Celtic peasantry, and it had resisted more than one attack. But it was not so defended as to oppose regular troops. Lundy, the governor, was in secret communication with the enemy, and prepared to hand over the town to them; but some of his own officers protested against this course, and the citizens, remarkable at the time for that high spirit which characterizes a dominant race, and the possession of those qualities which made the soldiers of Cromwell famous, determined not to yield. The bishop, Ezekiel Hopkins, in vain inculcated the doctrine of passive obedience at a conference; he was interrupted by a lad, one of a daring band known as the "thirteen Scotch apprentices," who called out: "A good sermon, my lord—a very good sermon; but we have no time to hear it now." A Scotch fanatic named Hewson urged the Presbyterians not to ally themselves with the enemies of the covenant; but he was laughed at by his countrymen. The thirteen apprentices closed the city-gates, and defied the enemy. It was then that Walker, described as an aged clergyman who had taken refuge in the city, encouraged the townspeople to fight to the last. Walker saved Lundy from the rage of the populace, and enabled him to quit the city in safety. Maj. Baker, who soon after died, and Walker became joint-governors, aided by capt. Adam Campbell. The siege is the most memorable in British history. It began in April, and lasted till the end of July, 1689. The inhabitants were reduced to the greatest extremities by Langer, but they were sustained to the last by the rousing

sermons preached to them by Walker in the cathedral, and the example he and capt. Campbell set in heading sallying-parties. When the siege was raised by the English fleet entering the harbor, Walker went to London. He was warmly received at court, thanked by the house of commons, created D.D. by Oxford, and bishop of Derry by the king. Portraits of him were in every house in England, and his triumph would have been complete had the Presbyterians not thought that their share in the defense of the city was overlooked, and provoked useless controversy. Walker could not be induced to take quiet possession of his bishopric; he would head a troop at the battle of the Boyne, and he was there killed. A lofty pillar has been erected to his memory at Londonderry, and the Walker club and the Campbell club have kept alive to our times the recollection of the siege. Walker published in 1689 *A True Account of the Siege of Londonderry*.

WALKER, JAMES, D.D., 1794-1874; b. Mass.; graduated at Harvard college in 1814, studied divinity, and was settled over the Unitarian church in Charlestown, 1818-39; when he became professor of moral and intellectual philosophy in Harvard college, of which he was president, 1853-60. Dr. Walker, who was editor of the *Christian Examiner*, 1831-39, published for undergraduate use editions of Reid *On the Intellectual Powers*, and Stewart's *Philosophy of the Active and Moral Powers*; *Sermons* (1861); *Memoir of D. Appleton White* (1863); and *Memoir of Josiah Quincy* (1867). He bequeathed to Harvard college his library and \$15,000. He was a man of intellectual keenness and literary taste, with great moral fidelity and beauty of spirit.

WALKER, JAMES BARR, D.D., b. Philadelphia, 1805; principal of an academy, New Durham, N. J.; studied law, Ravenna, Ohio; studied at Western Reserve college, Hudson, Ohio, 1828-31; edited *Ohio Observer* at Hudson; *Watchman of the Valley*, Cincinnati; *Watchman of the Prairies*; studied theology; licensed as a Congregational preacher, 1841; established at Mansfield, Ohio, a private orphan asylum; preached at Sandusky; lecturer at Oberlin college and Chicago theological seminary on Harmony between Science and Revealed Religion. He published *Philosophy of the Plan of Salvation*; *God Revealed in Creation and in Christ*; *Philosophy of Skepticism*; *Philosophy of the Divine Operations in Human Redemption*; *Poems*; *The Living Question of the Age*; *Doctrine of the Holy Spirit*.

WALKER, JOHN, 1732-1807; b. England; was a merchant, an actor, a school-master, and a teacher of elocution. In the last he attained great success in London, Oxford, Scotland, and Ireland. In 1772 he published *Pronouncing Dictionary of the English Language*, followed by *A Rhyming Dictionary*; *Elements of Elocution*; *The Critical Pronouncing Dictionary and Exposition of the English Language*, for many years the standard of the language; *Key to the Classical Pronunciation of Greek, Latin, and Scripture Proper Names*; *Outlines of Grammar*. He was educated a Presbyterian, but became a Roman Catholic.

WALKER, ROBERT JAMES, 1801-69; b. Penn.; graduated at the university of Pennsylvania, 1819; studied law and was admitted to the bar, 1821. He began his political career at an early age. In 1826 he settled in Mississippi, became a prominent democratic leader, and was U. S. senator, 1837-45. He had great influence in destroying the U. S. bank, and in the admission of Texas to the union. From 1845 to 1849 he was secretary of the U. S. treasury. In 1857 he was made gov. of Kansas, but two years later resigned, "being unwilling to aid in forcing slavery on Kansas by fraud and forgery." He was loyal in the civil war, and as financial agent of the United States in Europe, effected large sales of our bonds. He published the *Mississippi Supreme Court Reports*, 1818-32, *Arguments on the Mississippi Slave-Question*, 1841, and was for some time editor of a monthly magazine.

WALKER, SEARS COOK, 1805-53; b. Mass.; graduated at Harvard college, 1824; taught school near Boston; removed to Philadelphia; taught and engaged in scientific labors; prepared, 1837, a plan for an observatory in connection with the high-school; contributed many observations to *American Journal of Science*, and the *Memoirs of the Philosophical Society*; published a memoir on the periodical meteors of August and November; was appointed to the Washington observatory, 1845; had charge of the longitude computations of the U. S. coast-survey, 1847; with prof. Bache developed the method of determining difference of longitude by telegraph.

WALKER, TIMOTHY, 1802-56; b. Mass.; graduated at Harvard college and the Harvard law school, and began the practice of law at Cincinnati in 1831. Two years later, in association with judge Wright, he founded a law school in which he was professor till 1844. He became presiding judge of the Hamilton co. court of common pleas in 1842. He afterward edited the *Western Law Journal*. He wrote an *Introduction to the Study of American Law*, and other works.

WALKER, WILLIAM, 1824-60; b. Tenn.; studied medicine and law; edited the *Crescent* newspaper, New Orleans; co-editor of *San Francisco Herald*, 1850; started in San Francisco, 1853, an expedition for the conquest of Sonora; landed at La Paz, Lower California; proclaimed the independence of the peninsula; declared himself president; captured two or three towns, annexed Sonora to his territory; received a re-enforcement under col. Watkins, and with 100 men set out overland for Sonora; their provisions being exhausted, the party dissolved, Walker surrendered to the U. S. authorities at San Diego, was tried, and acquitted. He landed 'n 1855 with 62 men in Nicaragua, gained

two battles, took possession of Granada, and was appointed generalissimo of the republic; afterward caused himself to be elected president. A powerful insurrection was excited by his arbitrary acts, and after several battles he surrendered, May 1, 1857, with 16 of his officers, to com. C. H. Davis of the U. S. sloop-of-war *St. Mary's*, and was taken to the United States. Again he set out, landing at Punta Arenas, Nicaragua, Nov. 11; was obliged by com. Paulling, U. S. navy, to surrender with 132 of his followers, and taken as a prisoner to New York. June 16, 1860, he left New Orleans, landed at Truxillo, was captured, condemned by a court-martial, and shot. He died professing himself a Roman Catholic.

WALKER, WILLIAM JOHNSON, 1790-1865; b. Charlestown, Mass.; son. of maj. Timothy Walker; graduate of Harvard university, 1810; studied medicine, practiced in Charlestown, and became distinguished as a surgeon. In 1861 he established professorships in mathematics at Williams and Tufts colleges, and built Walker chapel at Amherst; the worth of the property given being estimated at \$90,000. The total amount of his gifts was \$400,000, and at his death in Newport, R. I., he divided \$1,000,000 in bequests for educational purposes.

WALKING-LEAF. See LEAF-INSECT.

WALKING-STICK, the popular name of many insects of the family *phasmida* (q.v.), destitute of wings, and having a long, slender, cylindrical body, like a small stick with the bark on, the delicate legs resembling little twigs. Their habits are very similar to those of the leaf-insects or walking-leaves, and their peculiar appearance is, in like manner, their protection. Most of them are natives of warm climates, and they are widely distributed. Some of them attain a large size. *Phasma gigas*, an East Indian species, is 7 or 8 in. long. A species, between 3 and 4 in. long, *P. femoratum*, is found even in the northern and north-western parts of the United States.

WALKING-STICKS. The habit of using a stick, either for support or merely as a fashion, is of great antiquity; and in modern times, the supply of such articles constitutes a large branch of trade in European countries, especially in Britain, France, and Germany. The imports into London and other English ports of sticks in the raw state, to be afterward dressed and mounted, is enormous, exceeding four and a half millions annually, and reaching a value of about £25,000. They chiefly consist of the small stems or canes of certain palms, as the Malacca cane; and others called Whangce and Penang laways; the woody stems of some small species of bamboo are also used, besides straight shoots of orange, cinnamon, myrtle, and other shrubs. The preparation and sale of walking-sticks are extensively carried on in Hamburg, and the finer sorts are richly and tastefully mounted in Paris. London is, however, the greatest mart for all kinds of walking-sticks. Of British trees and shrubs, the oak, crab, hazel, and sloe are used to some extent for the manufacture of walking-sticks.

WALKYRIES, beings of the Scandinavian mythology (q.v.), the legend of whom is the most terribly beautiful in the whole system. The name is derived from the old Norse *val*, which signifies a heap of slaughtered men, and *kjora*, to choose. *Val* itself contains the notion of chosen, elect, being allied to Ger. *wahlen*, Scotch *scale*, to choose. The walkyries, also called battle-maidens, shield-maidens, wish-maidens, are charming young women who, adorned with golden ornaments, ride through the air in brilliant armor, order battles, and distribute the death-lots according to Odin's commands. Fertilizing dew drops on the ground from the manes of their horses, light streams from the points of their lances, and a flickering brightness announces their arrival in the battle. With their charming glance, they rejoice the glazing eye of the hero, and lead him to Walhalla, where they act as his cup-bearers. Two walkyries, Hrist and Mist, are cup-bearers to Odin himself.

They differ in regard to their origin; some of them spring from elves and other superhuman beings; some also are the daughters of princes, who in their lifetime are numbered among the walkyries, showing all their qualities, and when they die, their spirits become walkyries. They ride generally in companies of three, or of three times three, or four times three, and have the gift of changing themselves into swans. They often choose noble heroes for lovers. Whoever deprives a walkyrie of her swan-robe gets her into his power. But the song of the walkyries sounds terrible, as sitting on a hill, they weave the fateful battle-web. The walkyries were frequently confounded with the norms or destinies. They were also conceived under the figure of the clouds. Thus, Hrist signifies dark sky, and Mist signifies quaking. Most of the names of the walkyries, however, relate to war and battle.

WALLABA TREE, *Eperva foliata*, a tree of the natural order *leguminosæ*, suborder, *Cesalpinceæ*, a native of Guiana. The wood is deep red, often variegated with whitish streaks, hard, heavy, shining, resinous, and very durable. The leaves are pinnate, without a terminal leaflet; the flowers in panicles of numerous distinct racemes.

WALLABOUT BAY, in Brooklyn, in the East river, opposite the s.e. extremity of Manhattan island. The small island which divides it from the East river, and the land bordering on the bay form the Brooklyn navy-yard. During the revolutionary war the British prison-ship *Jersey* was stationed in Wallabout bay.

WALLACE, a co. in w. Kansas, having the state line of Colorado for its w. boundary; about 2,000 sq.m.; pop. '80, 686—566 of American birth, 6 colored. Its surface consists of fertile prairies, part of the great plains, and is destitute of timber. Co. seat, Wallace.

WALLACE, ALFRED RUSSEL, traveler and naturalist, was born at Usk in Monmouth, Jan. 8, 1822, and was educated for the profession of land-surveyor and architect, a calling he exercised until 1845, when he devoted himself exclusively to naturalistic studies and researches. He spent four years on the Amazon, and eight years amongst the Malay islands, making extensive zoological collections. It was while living in the east that, unaware of Mr. Darwin's cognate researches and speculations, Wallace formed and committed to writing a theory of development by natural selection, though not using the latter term. Valuable contributions to zoology, botany, and cognate subjects are to be found in his *Travels on the Amazon and Rio Negro* (1853); *Palm Trees of the Amazon* (1853); *The Malay Archipelago* (2d ed. 1869); *Contributions to the Theory of Natural Selection* (1870). *The Geographical Distribution of Animals* (1876) practically founded a new science. *Tropical Nature* appeared in 1878. In a work *On Miracles and Modern Spiritualism* he vindicates views that have found few champions among men of science.

WALLACE, HORACE BINNEY, 1817-52; b. Penn.; educated at the university of Pennsylvania and the Princeton college, where he graduated, 1835; studied medicine and law, but never practiced. He assisted judge Hare in editing *American Leading Cases*; *Smith's Leading Cases*; and *White and Tudor's Leading Cases in Equity*; published a novel, *Stanley, or the Recollections of a Man of the World*, and left works on European travel and literary criticism, published posthumously. In 1852 he was attacked by brain disease and committed suicide. His brother, **JOHN WILLIAM**, b. Penn., 1815, also studied law; 1842-53; was reporter for the U. S. circuit court (3d circuit), and in 1864 was appointed reporter of the U. S. supreme court which position he still holds. He has published a work on law reporters of great value, and has edited various collections of cases.

WALLACE, LEWIS, b. Ind. 1827; served through the Mexican war, and afterward practiced law in his native state, of whose senate he was a member for a year. He was adj.gen. of Indiana at the beginning of the war of the rebellion; was soon made brig. gen. of volunteers, and commanded a division at fort Donelson, receiving a maj.gen.'s commission for his gallantry. In 1863 he prevented the capture of Cincinnati by gen. Kirby Smith. Taking command of the 8th army corps, he met Early marching on Washington, and was defeated by him at Monocacy in July, 1864. Gen. Ord was directed by gen. Halleck to supersede Wallace, but the latter was promptly re-instated by Grant. Wallace had, in fact, succeeded in his object, which was to give Grant time to re-enforce Washington from City Point. He was afterward a member of the court which tried the assassins of Lincoln, and president of the court which tried Wirz of Andersonville. He has published *The Fair God* (1873); and *Ben-Hur* (1880). He is now (1881) minister to Turkey. His wife is known as a brilliant and picturesque writer of historical and descriptive sketches.

WALLACE, ROBERT, D.D., b. Scotland, 1831; educated at Geddes institution, the high school, Edinburgh, and the universities of St. Andrews and Edinburgh, graduating M.A. in the former, 1853; ordained in the Presbyterian church, and became successively minister of Newton-upon-Ayr, 1857; of Trinity college church, Edinburgh, 1860; of Old Greyfriars, Edinburgh, 1868; received degree of D.D. from the university of Glasgow, 1869; elected professor of church history in the university of Edinburgh, 1872; succeeded Dr. Russel as editor of the *Scotsman*, 1876.

WALLACE, WILLIAM, the famous Scottish patriot, was the younger son of a knight of good family in the s.w. of Scotland. Neither the date nor the place of his birth has been ascertained; but there is no doubt that the former may be assigned to the middle of the reign of Alexander III. Nothing certain is known of his education or his early years. Blind Harry's half-fabulous poem has indeed inseparably associated his birth with Ellerslie, his boyhood with Dundee, and his youthful manhood with Ayrshire; but his true history, even in the next generation, was so obscure, that it is now impossible to separate truth from falsehood or exaggeration. He first appears in the light of authentic history as the chief of a band of insurgents against Edward, king of England. Taking advantage of his superior power, of his influence over the barons of Norman race, who then were the foremost persons among the nobility of Scotland, and of the position of umpire to which he had been chosen by the various claimants to the Scottish crown, Edward had established his supremacy over the northern kingdom, and afterward deposed John Balliol, and attempted to govern in his own absolute right. See **SCOTLAND, History**. The injustice of the claim, and the cruelty with which it was enforced, roused the opposition of all classes in Scotland except the higher nobles. The gentry and the middle and lower classes of the Lowlands, had for many years identified themselves with the country in which they dwelt, rather than with the great English race from which most of them drew their descent; and what has been called the war of independence began, which resulted in the deliverance of Scotland from foreign rule, at the cost of the

comparative civilization and tranquillity which the country had enjoyed under the descendants of Malcolm Canmore. In this struggle Wallace was the most successful leader; and in the course of the year 1297 the insurrection became general. Edward himself was at that time in Flanders; but his general in Scotland, the earl of Surrey, led his army to Stirling. On Sept. 11 they encountered the Scots under Wallace, and were completely defeated. The whole kingdom submitted to Wallace; who, passing the border, ravaged Cumberland and Northumberland without opposition. On his return from this expedition he was elected by his countrymen governor of Scotland, in name of king John, whose title was still recognized. In the following year Edward in person entered Scotland at the head of a numerous army. He was met at Falkirk (q.v.) by Wallace on July 22; but the Scots were defeated. It is generally assumed that the jealousy of some Scottish nobles, who envied the position of the governor, had aided in bringing about the disaster, and Wallace, in consequence resigned his high office. With this event, his brilliant public career may be said to have terminated. All that is certainly known is that he continued to struggle for his country's independence, and never made his submission to Edward, or took those oaths of fealty to him which were so lightly made by the Scottish nobles, and as recklessly broken. The events of this period related by modern writers under the name of "Lives of Wallace," are either transactions in which there is no evidence that he took any part, or the doubtful legends which, as years went on, gathered round the name of the Scottish hero. Some documents of undoubted authenticity make it probable that he was for some time in France. The close of his life forms an exception to this obscurity. When Edward offered pardon to the other Scottish leaders on certain terms, Wallace was excepted by name. If he chose to surrender, he might do so, but it was to be without conditions, and his life was to be at the king's mercy. Efforts were also made to discover his retreat and secure his person, and these were finally successful. In the year 1305 he was seized by some of his own countrymen, and delivered to Edward. He was carried to London, and with a mockery of the forms of justice, tried for treason. He denied the charge, asserting, with truth, that he had never been the vassal or subject of Edward; but his plea was disregarded. He was condemned and executed on Aug. 23; and his death was accompanied by acts of barbarity uncommon even in that age, and marking the merciless character which distinguished the later years of the English king. Contradictory as are the accounts of the English and Scottish chroniclers, it is not difficult to discover the true character of Wallace. He was the true leader of a national insurrection against a foreign yoke. The cruelties inflicted in his invasion of England are undeniable, but he did what he could to mitigate them; and he should not be severely blamed if, under far greater provocation, he tolerated what the good king David, in his war of the standard, was unable to prevent. His memory lives, and will ever live in the hearts of his countrymen, who know that they owe to him and to those who followed in the same course, that their history has not been as unhappy as the history of Ireland. The chief authority for the life of Wallace, as told by popular Scotch writers, is the poem of Henry the minstrel, who lived, however, nearly two centuries after his hero, and whose narrative is an almost unbroken series of picturesque impossibilities. The fullest modern account is that given by Mr. Tytler in the first volume of his *History of Scotland*, and in his *Life of Wallace* in the first volume of his *Scottish Worthies*; but Tytler is to a large extent *Blind Harry* over again, with judicious excisions. All that is really known of Wallace will be found in Mr. Burton's *History of Scotland*, and it is satisfactory to know that the result of a careful examination of the real facts by a writer so impartial, and so little apt to be carried away by enthusiasm, corroborates the most favorable estimate of Wallace's character.

WALLACE, WILLIAM VINCENT, a British musician and composer of operas, was born at Waterford of Scotch parents, June 1, 1814. He early attained proficiency as a performer on the pianoforte and violin—his performances on the latter instrument bringing him under the notice of Paganini. After being for some years leader of the orchestra of a Dublin theater, he emigrated to Australia, where he lived for a considerable time in the bush, and then suddenly appeared in Sydney as a musician, and gave concerts in Australia, New Zealand, India, and America. In 1845 he came to England, and wrote his first opera, *Maritana*, which was an immediate success both in London and Vienna, and still holds the stage as one of the most popular of English operas. *Matilda of Hungary* followed in 1847. During a sojourn of some years in Germany, Wallace added further to his musical culture; and after again visiting America, composed *Lurline*, which was brought out in London in 1860, with even greater success than *Maritana*. In 1861 he produced *The Amber Witch*; in 1862, *Love's Triumph*; and in 1863, *The Desert Flower*. Wallace died at the château de Bagen, in the s. of France, Oct. 12, 1865, leaving another opera, *Estrella*, nearly completed. Without possessing genius of the very first order, Wallace was a highly-cultivated musician; the freshness of the motives, and the brilliancy of the orchestration of his operas, particularly *Maritana* and *Lurline*, have stamped their author as one of the chief English composers of this century.

WALLACHIA. See *MOLDAVIA*, *ante*.

WALLACK, JAMES WILLIAM, 1795-1864; b. London; played at Drury Lane theater with Edmund Kean in Shakespearean parts. He came to New York in 1818, making his appearance at the Park theater as Macbeth the same year. He assumed the management of Drury Lane theater in 1820; opened the National theater, New York, in 1837; and Wallack's lyceum, afterward called Wallack's theater, at the corner of Broome street and Broadway, in 1852; it was rebuilt at Broadway and 13th street in 1861, and is now (1881) being rebuilt at Broadway and 30th street. He was an excellent comedian.

WALLACK, JOHN LESTER, b. New York, 1818; son of James William. He is the proprietor of Wallack's theater (see **WALLACK, JAMES WILLIAM**), and has long been known as one of the most finished actors on the American stage.

WALLA WALLA, a co. in s.e. Washington territory; separated from Idaho on the e. by the Columbia river. In 1875 the new county of Columbia was formed from its e. portion; former number of sq. m., 3,500; pop. '80, 8,716—6,847 of American birth, 588 colored. Co. seat, Walla Walla.

WALLA WALLA, a city in Washington territory, incorporated, 1862; county seat of Walla Walla co., 610 m. n.e. of San Francisco, 75 m. s.w. of Lewiston, Idaho; pop. '75, 4,500. It is situated in the valley of the Walla Walla, is regularly laid out, and connected by mail stage lines with the Central Pacific railroad at Kelton, Utah, 385 m. distant, and with Portland by a line of steamers on the Columbia river which is reached by the Walla Walla and Columbia railroad, 32 m. long, terminating at this place. It has an important trade in grain, fruit, hides, cattle, and manufactures of lumber, furniture, bags, flour, etc. It has public schools, a public library, 2 private banks, 7 hotels, 6 churches, and 3 newspapers.

WALLENSTEIN (or, more correctly, **WALDSTEIN**), **ALBERT WENCESLAS EUSEBIUS** von, Duke of Friedland, Sagan, and Mecklenburg, the most remarkable of the long series of eminent men who owe their prominence on history's page to the thirty years' war, was the third son of a noble though not wealthy Bohemian family, and was born at the château of Hermance, in Bohemia, Sept. 15, 1583. His parents, who were Protestants, intrusted the care of his education to the Moravian brotherhood of Koschumberg, who, however, made little of their stubborn and passionate pupil. On his parents' death, his uncle, Albert Slavata, a zealous Catholic, took charge of the wayward youth, and having won him over to his own creed, sent him to the Jesuit *convictorium* at Olmütz, and to the universities of Altorf, Bologna, and Padua, where his education, such as it was, was completed. Wallenstein's course of training had not eradicated, or even moderated, the prominent faults in his natural disposition; on the contrary, his wilfulness and independent spirit had gathered stability and strength from ineffective opposition; and his first prominent appearance on the stage of events showed a man of extreme individuality, gifted with great and versatile ability, but equally remarkable for obstinacy, passion, and pride. He afterward visited Germany, France, and Holland, took service in the imperial army, then engaged with the Turks and Hungary, and, returning home at the close of the war (1606), married an aged widow of noble rank, who, at her death (1614), left him the whole of her great wealth. This, along with the fourteen domains bequeathed to him by his uncle, made him one of the richest and most influential lords of Bohemia, a position recognized by the imperial court by the bestowal on him of the title of count and the military grade of col. A second marriage in 1617 with the daughter of count Harrach, the emperor's favorite, and Wallenstein's firm adherence to the imperial side during the Bohemian insurrection; his maintenance, at his own expense, of a large body of troops; and his brilliant and well-directed gallantry at the battle of Prague, and in various contests with Mansfeld and Bethlem Gabor, added a powerful influence at court to his hitherto only local eminence. The latter, however, was now much increased by his purchase, at much less than their value, of sixty confiscated lordships in Bohemia; and Ferdinand II. felt himself impelled to recompense the valuable services of his faithful subject by (1623) raising him to the dignity of a prince of the empire, with the title of *duke of Friedland*. (Friedland is a town situated close to the Prussian frontier, about 60 m. n.e. of Prague.) Two years after, when the impossibility of maintaining an army sufficient to restrain the Protestant league from uniting with the Danes against him, threw the emperor almost into despair. Wallenstein, seizing such a favorable opportunity of gratifying his ambition, offered to raise, equip, and maintain 50,000 men free of charge, provided he were intrusted with the absolute command, and allowed to appoint his own officers: a proposal greedily accepted by the emperor. Wallenstein raised 30,000 in Bohemia; adventurers from all quarters flocked to his standard; and in a short time his army far exceeded the promised number. With this motley but not ill-disciplined array, he then marched into North Germany, and acting in concert with Tilly (q.v.), routed Mansfeld at Dessau, hunted him through Silesia and Moravia, and on his junction with the army of Bethlem Gabor in Hungary, compelled, by skillful strategy, the combined forces to remain on the defensive. Released by a truce with the Transylvanian prince and the death of Mansfeld, he returned by Silesia, recovered the fortresses which Thurn had captured, forced the elector of Brandenburg to submit to the emperor, and joined Tilly in annihilating the military power of Denmark. The value of these services to the emperor's cause was inestimable, as Ferdinand well knew, and he accordingly turned a deaf ear to the loud complaints of the

North Germans, who had suffered grievously from the rapacity, oppression, and license which Wallenstein's soldiers were allowed to exercise without the slightest opposition; and rewarded their leader by the gift of the Mecklenburg duchies, the rank of generalissimo on land, and admiral of the Baltic. Wallenstein speedily made himself master of his new territory; fitted out a fleet of 15 sail, by the aid of which he captured Usedom and Rugen, with various Baltic ports, and laid siege to Stralsund. But the Danes annihilated his navy; and the Swedes succoured Stralsund, the siege of which he abandoned in despair. But as under cover of the dread inspired by Wallenstein's arms, Ferdinand had resumed his tyrannical and aggressive schemes (see 'THIRTY YEARS' WAR) in Germany, the Catholic league, headed by the duke of Bavaria, became bitter adversaries of Wallenstein, and backed by the intrigues of France (which was represented at Vienna by father Joseph, a master of subtle and unscrupulous diplomacy), partly forced and partly cajoled the emperor to dismiss Wallenstein, an act for the probable consequences of which even Ferdinand, with his extraordinary fortitude, trembled. Wallenstein, however, disappointed his sovereign's fears and his enemies' hopes by obeying with apparent cheerfulness, being somewhat moved thereto by the predictions of his favorite astrologer,* who declared his star to be only temporarily eclipsed and that it would soon shine forth again with far greater luster; and retired to Prague, where he lived in his magnificent palace in sovereign state, surrounded by a court composed of barons, knights, and the principal officers of his army. But the insult and injury he had received were eating into his soul; the frankness and affability to his subordinates, which had hitherto distinguished him, were changed for a gloomy taciturnity; and much of his time was spent in solitude, brooding over his wrongs, and scheming for revenge on the duke of Bavaria, whom he justly accused of being the cause of his disgrace; though all the while he kept a calm but eager watch over the changes of opinion in the court of Vienna, where several of the ministers and numerous secret agents were either in his pay, or devoted to his interests. His eminent services, his immense popularity, and his great talents, pointed him out as the only hope of the empire after Tilly's death, and Ferdinand saw himself forced almost to kneel to his haughty subject, and beseech him again to gird on his sword; but Wallenstein for a long time affected the utmost indifference to re-engaging in active service, and at last consented only on such conditions as made him the independent ruler of the empire in military affairs. With the Swedes on the Danube, the Saxons in Bohemia, and the army of the League almost annihilated, the emperor had no choice; and Wallenstein, three months afterward, was at the head of 40,000 men, well armed and disciplined. But commands and entreaties were in vain employed to induce him to save Bavaria from the Swedes; and he lay idle at Leitmeritz, gloating over the pangs of his enemy, till, on Austria being threatened, he advanced to Eger, and by menacing at once Saxony and Nuremberg, brought Gustavus to a stand-still. The two armies lay opposite each other for 10 weeks, each suffering the extremities of famine, hardship, and sickness, in the hope of wearying out the other. At last, when half their numbers had succumbed, Gustavus, who had made a fruitless attempt to storm Wallenstein's camp, retreated to the Danube, whence his skillful opponent soon drew him by marching on Saxony. The two again confronted each other at Lutzen (q.v.), and though Wallenstein was completely defeated, it was chiefly owing to the superior discipline and *morale* of his opponents. His army was recruited and reorganized in Bohemia; and, unable to make head against Saxons and Swedes combined, he found it advisable to gain time by amusing his antagonists with illusory negotiations, after repeated vain endeavors to persuade the emperor to come to terms with the Protestant princes. Meantime his old enemies of the league were in full activity at Vienna; and the emperor, chagrined at the humiliations to which he had subjected himself to gain Wallenstein's aid, was not slow to give credit, real or feigned, to their misrepresentations; his ill-concealed dislike was developed into hatred by the stubborn pertinacity with which Wallenstein insisted on the full observance of the terms of their agreement; and on Wallenstein, who was kept well informed of the state of matters at court, attempting to attach his officers permanently to himself by obtaining their signatures (Jan. 12) to an agreement to that effect, the emperor (Jan. 24, 1634) declared him a rebel, and ordered two of his old officers, Piccolomini and Gallas, who had for some time been acting as spies on his actions, to take him dead or alive. Wallenstein, with some devoted adherents, including a guard of 200 dragoons, took refuge in Eger, but was there assassinated, Feb. 25, 1634. Wallenstein was tall, thin, and wiry, with lively brilliant eyes, tawny-reddish hair, and an unhealthy-looking, yellow complexion. "He was far superior to his sovereign in true policy, liberality of sentiment, and religious toleration; but these qualities only rendered him more obnoxious to the bigoted emperor and his ministers. As a general, he holds the foremost rank, vigilance and presence of mind, great judgment and unflinching perseverance, being his prominent characteristics; and of him alone can it be said that he checked the progress and foiled the designs of the great hero of Sweden. After his death, it was seen that the treacherous murder of one who had twice saved the empire from destruction called for some justification; and accord-

* Wallenstein, during his attendance at the Italian universities, had deeply studied astrology; and although far too much has been made of this fact by his biographers, there is no doubt that the mystic doctrines of this pseudo-science had a strong hold on his mind, and at times much influenced his conduct.

ingly a paper was published by imperial authority, in which an attempt was made, by misrepresenting every overture he had made to his opponents, and every scheme he had employed to divide his numerous enemies at court, to prove that he had constantly meditated treason from the time of his first disgrace. This view and its opposite have found numerous and enthusiastic supporters; but without going further into detail, we may observe that the overtures made by him to the Swedes and Saxons while in command were undoubtedly *ruses de guerre*, and were invariably found to be such by his opponents; that when the Saxons invaded Bohemia, and took Prague, where he was residing in disgrace at the time, he took no part on either side, except such measures as an influential citizen would adopt for the safety of the inhabitants from insult and spoliation; and lastly, that when, after he had been declared a rebel, he *did* make "treasonable" overtures to Bernhard of Weimer, the latter, though Wallenstein's defection would at that time have been of the utmost importance, could not convince himself that this was not another artifice; a proof that the former overtures were as above stated.—See Cox's *House of Austria*; Harte's *History of the Life of Gustavus Adolphus* (1759); Pelzel's *Geschichte der Böhmen* (Prague, 1774, 1779, and 1782); *Wallenstein's Briefe* (ed. by Forster, 1826); Ranke's *Geschichte Wallenstein's* (1869); Gindely, *Neues über Wallenstein* (1876); articles by Hallwich in the *Archiv für Säch. Gesch.* (1876), and by Lorenz in *Sybel's Historische Zeitschrift* (1878).

WALLER, a co. in s.e. Texas, bounded on the w. by the Brazos river; 350 sq.m.; pop. '80, 9,024—8,694 of American birth, 5,832 colored. Co. seat, Hempstead.

WALLER, EDMUND, celebrated as one of the refiners of English poetry, was b. at Colleshill, Herts, March 3, 1605 or 1606. He was of an ancient and opulent family, and having passed through Eaton and King's college, Cambridge, was returned to parliament, at the early age of 18, a member for Amersham, Bucks. In 1631 he married a London heiress, who died shortly afterward; and the rich widower made suit to lady Dorothy Sidney, eldest daughter of the earl of Leicester, whom he poetically and perseveringly commemorated under the name of Saccharissa. Lady Dorothy, however, was inexorable: "she was not to be subdued," as Johnson says, "by the powers of verse." Meeting him in her old age, she asked the poet when he would again write verses upon her, and he ungallantly replied: "When you are as young, madam, and as handsome as you were then." In the long parliament, Waller joined the party of Hampden (who was his cousin), and he was one of the commissioners appointed to negotiate with king Charles I. at Oxford in 1643. He was soon gained over by the royalists, and entered into a conspiracy against the dominant party in the house of commons, for which he was fined £10,000, and banished the kingdom. His conduct on this occasion was mean and disgraceful. He not only confessed all he knew, but all that he suspected; attempted to criminate innocent persons, and humbled himself before the house of commons in language inexpressibly abject and humiliating. After eight years' exile, spent in France and Italy, he was suffered to return to England; and he then became a supporter of the commonwealth, and a panegyrist of Cromwell, to whom he was distantly related. When Charles II. was restored, Waller was equally ready with a poetical congratulation; but his loyal strains were much inferior to those with which he had hailed the protector; and it is said that when Charles reminded him of this fact, the poet wittily replied: "Poets, sir, succeed better in fiction than in truth." Up to his 80th year, Waller continued a member of the house of commons, delighting all parties by his wit and vivacity. He died at Beaconsfield, Oct. 21, 1687. Waller began early to write verses, and published two collections of his poems—one in 1645, and another in 1664. An edition appeared in 1711, edited by Atterbury; and one in 1729, with copious "Observations" by Fenton. Pope has eulogized the *sweetness* of Waller's verse. Some of his smaller pieces are characterized by infinite grace and harmony; he has also occasional dignity and striking imagery, as in the lines on Cromwell; and he is never involved or obscure: yet his rank among our poets is but a subordinate one, as he is deficient in passion, energy, and creative power.

WALLER, EDWIN, b. Va., 1800; removed to Texas, where he was made alcalde. The *Sabine*, a vessel belonging to him, carrying cotton on which the Mexican government had laid a duty, evaded its payment; Waller was imprisoned. On his release he brought back 2 cannons, which were of use in the war that ensued, and in which Waller was active. He helped to frame the constitution of Texas, was the first mayor of Austin, and chief justice of Austin county. He selected Austin as the site for the capital.

WALLETTE, a co. in n.w. Dakota, having the Missouri river for its s. boundary; bordering on Montana and British America; 3,350 sq.m.; pop. '80, with 3 other counties, 471—321 of American birth, 23 colored.

WALLFLOWER, *Cheiranthus*, a genus of plants of the natural order *crucifera*, having the siliques quadrangular from the prominence of the nerves on the back of the valves, the seeds in a single row in each cell, the stigma deeply 2-lobed, the lobes bent back. The flowers are in racemes. The species are annual, biennial, or perennial herbaceous plants, some of them almost shrubs. The COMMON W. (*C. cheiri*) is found in rocky places and on old walls in the s. of Europe, and also, but less abundantly, in the middle of Europe and in Britain. In its wild state, its flowers are always yellow; but

in cultivation, they exhibit a considerable diversity of colors, chiefly brown, purple, and variegated; and they attain a larger size. It is a universal favorite, on account of the delicious odor of its flowers. The varieties in cultivation are very numerous; but there are among them no marked distinctions. Double and semidouble flowers are not uncommon. The plant is perennial, but in gardens is generally treated as a biennial, although fine kinds are propagated by cuttings, which soon strike root under a hand-glass. The ordinary mode of cultivation is to sow the seed of an approved kind, and to plant out the seedlings. The flowers of wallflower have a bitter and cross-like taste, and were formerly used as a medicine.

WALLING, GEORGE WASHINGTON, b. N. J., 1823; studied law, but in 1842 the death of his father changed his plans and he became a steamboat engineer. He served in that position on a revenue cutter during the Mexican war, and at its close became a police officer in New York city. In 1853 he was appointed captain of police, and in 1869, inspector, in which capacity he greatly strengthened the efficiency of the force. In 1874 he was made superintendent of the police force of the metropolitan district, which position he still holds.

WALLINGFORD, a small, but ancient and interesting, parliamentary and municipal borough of England, mostly in the county of Berks, and on the right bank of the Thames, 13 m. n.w. of Reading. Of its three churches, that of St. Leonard's—rebuilt in 1849—has a Norman doorway. The earth works with which the Romans encompassed the town, are still distinctly traceable. The diversion of the London and Oxford road from Wallingford much injured the old town, and it is now a place of little consequence. The borough returns one member to the house of commons. Pop. '71, of municipal borough, 2,972.

WALLIS, Rev. JOHN, D.D., a very eminent English mathematician, was the eldest son of the rev. John Wallis, incumbent of Ashford in Kent, and was born there, Nov. 23, 1616. He was brought up with a view to the church, and was educated for his profession, to the strict exclusion of all other branches of knowledge, in accordance with the prevailing practice of the time, which was in his case carried to such an extent that even ordinary arithmetic was wholly neglected. Wallis never saw a book of arithmetic till he was 15 years old, and then only by accident. At the age of 16, he was entered at Emmanuel college, Cambridge, where at that time mathematics found no place in the course of study, being esteemed merely mechanical. After a brilliant career, he took his degree, was chosen a fellow of queen's, and took orders in 1640. On the outbreak of the civil war, he sided with the parliament, and was of great use to his party in deciphering intercepted correspondence, an art in which like Vieta (q.v.) and Battista la Porta, he was eminent. In 1644, he was one of the secretaries of the assembly of divines at Westminster, holding at that time the living of St. Gabriel, Fenchurch street; and, in the following year, he joined with other eminent men in the establishment of the meetings for mutual instruction, which, 17 years afterward, developed into the royal society. It was not till 1647 that he commenced the study of mathematics; and, in 1649, he was chosen Savilian professor of geometry at Oxford. The rapid progress he had made in his mathematical studies was evidenced by the publication of his greatest work, the *Arithmetica Infinitorum*, with a treatise on conic sections prefixed, in 1655. In the same year commenced his well-known controversy with Hobbes—regarding a quadrature of the circle, which the latter believed he had effected—which was continued at intervals till 1663, and was marked by the usual quaint caustic satire of the time. Wallis had, of course, the right side of the dispute; but unfortunately for posterity, his manly feeling of forbearance toward a deceased antagonist (Hobbes died in 1679) prevented him from admitting his polemical treatises into the collection of his works, which was published 1693-99. Numerous other mathematical works, as the *Mathesis Universalis* (1657), *Commercium Epistolicum* (1658), *Cuneo-Cuneus* (1663), *De Proportionibus* (1663), *De Aestu Maris* (1668), a treatise on mechanics (1669, 1670, 1671), editions of the works of Horrocks (1673), of the arenarius and quadrature of Archimedes (1676), and of Ptolemy's harmonics (1680), a treatise on algebra (1685), and edition of Aristarchus and of Pappus (1688), etc., were the products of his originality and industry. We have besides numerous minor theological works, polemical and expository, from his pen, none of which, however, are important enough to call for mention. Of his other works, the treatise on logic (1687) is of the highest excellence, and even at the present day is well worthy of perusal; and his English grammar (1653), written in Latin for the use of foreigners, has only of recent years, when the true principles of grammar are becoming better understood, received the attention it merits. About 1658, Wallis joined the party who were in favor of a restoration of kingly government, and his talent for deciphering was now put in practice against his former friends, an act for which he has been abused with virulent injustice. At the restoration he was confined in his professorship, was appointed keeper of the archives at Oxford, and royal chaplain. In 1692, he was consulted as to the adoption of the Gregorian calendar, and his strong disapproval decided the government to retain the old style. He died Oct. 28, 1703.

It is exclusively as a mathematician that Wallis's name has obtained permanently a niche in the temple of fame; though as an expositor of the cardinal doctrines of Christianity he was fully on a par with South and Sherlock; but his eminence in the former

character has thrown into shade even his services as a scholar, and few at the present time remember that it was he who first edited the musical works of Ptolemy, Porphyrius, Aristarchus of Samos, and the later work of Briennius, though the manner in which these labors were effected indicates unquestionably an immense expenditure of labor, and a high degree of scholarship. His *Arithmetica Infinitorum* is a successful attempt to solve, by means of the summation of series to infinity, a number of the more simple problems of the calculus, such as the evaluation of all cases of $\int x^m dx$; and, in

extension, to discover the limit of $\int (a^2 - x^2)^n dx$, of which the quadrature of the circle is a particular case. There are numerous other results, which are, at the present time, considered to belong to the more advanced stages of the calculus; and, in fact, Wallis is another example of the strange blindness which, in full possession of a principle, neglects to suit it with a generalized form of expression. The best known of Wallis's results is his formula for π , which gives

$$\pi = \frac{2.4.4.6.6.8....}{4} = \frac{2.4.4.6.6.8....}{3.3.5.5.7.7....} \text{ ad infinitum.}$$

WALLIS, SEVERN TEACKLE, b. Md., 1816; graduated at St. Mary's college, Baltimore, 1832; studied law and was admitted to the bar, 1837. Since 1870 he has been provost of the Maryland university, and is a trustee of the Peabody institute of Baltimore. He has published *Glimpses of Spain* (1849); and, *Spain, her Institutions and Public Men* (1853).

WALLON, HENRI ALEXANDRE, b. France, 1812; educated at the Paris normal school. In 1840 he was appointed professor at the Sorbonne, and gave lectures on geography and history. In 1871 he was elected to the national assembly as a moderate conservative. In 1875 he became minister of public instruction in the Buffet administration. He proposed the clause by which the republic was constitutionally established. In 1876 he was elected to the senate. Among his works are *La vie de Jésus et son nouvel historien* (1864), answering Rénan; and *La Terreur* (1872).

WALLOONS, the name given to a population belonging to the great Romanic family more especially to the French stock, and occupying the tract along the frontiers of the German-speaking territory in the South Netherlands, from Dunkirk to Malmedy. They are located more particularly in the Ardennes, in parts of the departments of Pas-de-Calais, Nord, Aisne, and Ardennes in France, but chiefly in South Brabant, as well as in the provinces of Hainault, Namur, Liège in Belgium, and in the greater part of Luxembourg, and finally in some towns and villages in the neighborhood of Malmedy in Rhenish Prussia. The Walloons, whose numbers in Belgium, where they are principally established, are stated at 2 millions, are the descendants of the old Gallic Belgæ, who held their ground among the Ardennes mountains when the rest of Gaul was overrun by the German conquerors, but became eventually Romanized, especially in their language, which appears now as a patois or popular dialect of French; of all the French dialects, however, the greatest number of Gallic words have been preserved in it. See the unfinished work by Grandgagnage, *Dictionnaire Etymologique de la Langue Wallone* (Liège, 1845). The name Walloon, in Dutch, *Walen*, sufficiently shows their Gallo-Romanic origin, and their relationship, partly by race and partly by language, with the Galli, Gaels, Walese, Welsh, Walachians, etc. The Walloons of the present day resemble their French more than they do their German neighbors. They are squat and middle-sized, with powerful limbs, dark hair, deep sunk, fiery, dark-brown or blue eyes. They surpass their Flemish neighbors in adroitness, activity, and skill; and their French in earnestness, perseverance, and diligence. In impulsiveness, they resemble the latter more than the former, but their anger sooner cools than that of the more deeply feeling Fleming. It is worthy of notice that the Belgian revolution was pre-eminently the work of the Walloon districts, and the most eminent statesmen of modern Belgium are of Walloon descent. It was against the Walloon spirit and tendencies that the Flemish movement (see FLEMISH LANGUAGE AND LITERATURE) was chiefly directed.

WALL-PIECE, a small cannon (or, in ancient times, an arquebus) mounted on a swivel, on the wall of a fortress, for the purpose of being fired at short-range on assailants in the ditch or on the covert-way. There are distinct evidences that the great wall of China was originally constructed for the reception of wall-pieces.

WALL-PLATE, a piece of wood laid along the top of the wall of a building to receive the feet of the rafters of the roof (q.v.).

WALLSEND, a parish in the co. of Northumberland, England, four m. e.n.e. from Newcastle, celebrated for its collieries, which produce a very large quantity of coal of very superior quality. About 2,000,000 tons of Wallsend coal are annually imported into London.

WALL-TREES, in horticulture are fruit-trees trained on walls for better exposure of the fruit to sunshine, and for the heat radiated from the wall. Brick walls are generally preferred, and have a great advantage in the regularity with which the nailing can be

accomplished, but trees are often also trained on stone walls, and the walls of houses are sometimes used for this purpose. Trees are trained on walls in hot-houses as well as in the open air. Flued walls are often used, the fruit being thus partially forced by artificial heat; and screens of various kinds, as of reeds, canvas, and oiled paper, are sometimes employed to protect blossoms in spring. Woollen nets are also much used for this purpose, and a net even with wide meshes affords much protection from spring frosts. Wall-trees, intended permanently to occupy the wall, are generally trained in the nursery with a dwarf stem only 5 or 6 in. in length, so that the branches may cover the whole wall, and no available part of it may be lost. It is usual, however, in planting to introduce *riders* alternately with the permanent wall-trees, which are grafted or budded on tall stocks, and occupy part of the wall till the other trees have become large enough to require it all for themselves. Garden-walls are generally 12 or 14 ft. in height. Different modes of training wall-trees are practiced, of which the principal are known as *fan training* and *horizontal training*. In the former, the branches are arranged like the spokes of a fan; in the latter, a main stem is led up, from which they are spread out horizontally on both sides. Different modes are preferred for different kinds of trees, and the art of the gardener is displayed in keeping to his plan of training, and *laying in* branches so as completely to fill up the space, and make every part of the wall productive. There is a Dutch mode of training, which consists in leading two chief branches horizontally to right and left, and training shoots from them straight up to the top of the wall. It is seldom employed in Britain, except for white currants. Riders are not unfrequently trained in a star-like form, some branches being led downward, in order to fill the wall as quickly as possible. It is necessary for the gardener in training wall-trees, to consider the habit of each kind, particularly whether fruit is chiefly to be expected on young branches or on the *spurs* of older branches. Superfluous branches must in all cases be carefully removed, and among these are to be reckoned all *fore-right shoots*, or branches which project straight from the wall. The use of small strands of cloth along with nails, to fasten branches to walls, is familiar to every one. These strands are renewed from year to year, so that they may not cause disease by interfering with the growth of the branches.

WALNUT, *Juglans*, a genus of beautiful trees of the natural order *juglandaceæ*. This order is nearly allied to *amentaceæ* (q.v.), and particularly to the sub-order *eupulifereæ* (q.v.) or *corylaceæ*, but differs in having the ovary one-celled, with a solitary erect ovule. The flowers are unisexual, the male flowers in catkins, the female in terminal clusters. The species, of which not quite thirty are known, are mostly natives of North America; a few are found in Asia. All are trees with alternate pinnated leaves. The genus *juglans* is distinguished by monoecious flowers, with 18 to 24 stamens; and a drupe with a deciduous fleshy husk, which bursts irregularly, and a deeply wrinkled shell (*putamen*) of two valves, within which is the seed, curiously lobed and wrinkled, with a membranaceous *testa* and partial dissepiments. The species of hickory (q.v.) were formerly included in this genus.—The COMMON WALNUT (*J. regia*) is a native of Persia and the Himalaya, but has long been cultivated in all parts of the s. of Europe. The date of its introduction is unknown, but it was certainly cultivated by the Romans in the reign of Tiberius. It is a lofty tree of 60 to 90 ft., with large spreading branches. Its foliage resembles that of the ash. The leaves have 2 to 4 pair of leaflets and a terminal one. They have a fine balsamic odor when bruised; this quality, however, being much more marked in some trees than in others. An infusion of them has been found useful in scrofula; and when bruised and rubbed on the skin they are efficacious in curing itch. Placed in wardrobes, they prevent the ravages of moths. The sap is limpid like water, but contains much sugar, so that the tree is sometimes tapped for it like the sugar-maple, and the sugar is procured by evaporation. A pleasant kind of wine is also made from it. An excellent pickle and a kind of ketchup are made of the unripe fruit. The ripe fruit is one of the best of nuts, and is an important article of export from many parts of the s. of Europe. Walnuts are also exported in large quantities from Cashmere and other Himalayan regions to supply the markets of India. The outer husk is removed before the nuts are brought to market. In the s. of Europe walnuts are a very considerable article of food, and when perfectly fresh they are wholesome and nutritious, although in the state in which they are imported into Britain they are not easily digestible. Just before they are ripe they are much used in France with vinegar, salt, pepper, and shallots. Among the varieties of walnut in cultivation is one with a very thin shell, which is much esteemed. Walnuts yield by expression a bland fixed oil, which under the names of *walnut oil* and *nut oil*, is much used by painters, and in the countries in which it is produced is a common article of food. The *cake* left after the expression of the oil is sometimes used as an article of food, and is also used for feeding cattle and poultry. The timber of the walnut is of great value, and is much used by cabinet makers. Gun-stocks are made of it. It is light, although hard and fine-grained. The wood of young trees is white and little esteemed; that of old trees is brown, veined and shaded with darker brown and black. The wood of the roots is beautifully veined. Both the root and the husks of the walnut yield a dye, which is used for staining light-colored woods brown. The walnut, when meant to become a timber-tree, is best sown where it is to remain, as the roots are much injured by transplanting. The best kinds of

walnut for fruit are generally grafted. The walnut succeeds well in Britain as an ornamental tree, even in the n. of Scotland, although it seldom quite ripens its fruit except in the warmest parts of England. It was probably brought to England by the Romans.* It takes its name from being foreign (A.-S. *wealh* or *wælk*).—Very similar to the common walnut is the BLACK WALNUT (*J. nigra*) of North America, found in most parts of the United States except the most northern. It is a very large and beautiful tree, the trunk sometimes 6 or 7 ft. in diameter. The leaves have more numerous leaflets than those of the common walnut. The timber is even more valuable than that of the common walnut, and is used for the same purposes. The fruit, however, is very inferior, although it is sold in the markets of American cities. The partial dissepiments of the kernel are thick and woody.—The BUTTER NUT (*J. cinerea*) is abundant in the northern and north-western states of North America, and in Canada. It is a tree only about 50 ft. high, with trunk about a foot in diameter; leaves with 15 to 17 leaflets; the fruit elongated, and externally covered with a viscid substance. The nut is hard and rough, with prominent ridges, of good quality, and sometimes brought to market in America. The wood is not apt to split or warp, and is useful for many purposes. Sugar is obtained from the sap, as from that of the maple, but is of inferior quality. The inner bark is a mild cathartic resembling rhubarb in its properties. The leaves reduced to powder are used for blistering, like cantharides.—To the natural order *juglandaceæ* belongs the genus *engelhardtia*, found in the Malayan archipelago and the Himalaya. The wood of *E. Roxburghiana*, a Himalayan species, is much valued by turners.

WALPOLE, HORACE, third son of sir Robert Walpole, first earl of Orford, was born in 1717. He was educated at Eton and Cambridge. After finishing his education, he traveled abroad for some years, principally in Italy, where he seems to have acquired those tastes for which he afterward became so well known. In 1741 he returned to England, and took his seat in parliament. But he had no taste for politics, and never took any active part in public life. In 1747 he purchased a piece of ground near Twickenham. Here he built his famous mansion—Strawberry Hill. Its erection and decoration may almost be said to have formed the principal occupation of his long life. In 1753 he published his *Catalogue of Royal and Noble Authors*. This was followed by *The Castle of Otranto*; *The Mysterious Mother*; and the *Historic Doubts on the Life and Reign of Richard III.* The works, however, to which he owes the preservation of his name are his *Letters*. These will always be interesting as pictures and records of the society and fashionable gossip of his day. Their interest is, however, considerably marred by their palpable want of truthfulness. On the death of his nephew in 1791 he became fourth earl of Orford. He died in his 80th year on March 2, 1797. "The faults of Horace Walpole's head and heart," says Macaulay, "are indeed sufficiently glaring. His writings, it is true, rank as high among the delicacies of intellectual epicures as the Strasbourg pie among the dishes described in *Almanach des Gourmands*. But as the *pâté de foie gras* owes its excellence to the diseases of the wretched animal which furnishes it, and would be good for nothing if it were not made of livers preternaturally swollen, so none but an unhealthy and disorganized mind could have produced such literary luxuries as the works of Walpole. . . . The conformation of his mind was such that whatever was little seemed to him great, and whatever was great seemed to him little. Serious business was a trifle to him, and trifles were his serious business."—See *Letters*, edited by Mr. Peter Cunningham (8 vols. 1857); also Macaulay's Essay on *Letters of Horace Walpole*.

WALPOLE, SIR ROBERT, third son of Robert Walpole, M.P., by Mary, daughter of sir Jeffrey Burwell, was born Aug. 26, 1676, at Houghton, in Norfolk. He received his education at Eton and at King's college, Cambridge. On July 30, 1700, he married Catharine, daughter of sir John Shorter, lord mayor of London. On Nov. 28 following, he succeeded to the family estates on the death of his father. In 1702 he was elected member of parliament for King's Lynn; and in 1705 he was nominated one of the council to prince George of Denmark. In this latter capacity he appears to have won the esteem of Godolphin, Marlborough, and other whig leaders. In 1707 he was appointed secretary at war; and in 1709 treasurer of the navy. Shortly after this, however, his fortunes suffered a temporary eclipse. He was found guilty by the house of commons of "a high breach of trust and notorious corruption," and accordingly, on Jan. 17, 1712, he was expelled the house, and sent to the tower. There can be little doubt that he had all his life a profound faith in bribery, and never scrupled to exercise it; but his punishment on this occasion seems rather to have been the result of party animosity than of virtuous indignation on the part of the house. He had all along been a strong Hanoverian, and on the accession of George I. he was restored to fortune. He was made a privy counselor, and had various other high offices conferred upon him. On the impeachment of Bolingbroke and others by his means, he became, in 1715, chancellor of the exchequer, and first lord of the treasury. A disunion of the cabinet having arisen in 1717, he resigned office, bringing in a sinking-fund bill on the day of his resignation. In opposition, he was the determined enemy of the South sea scheme. He was recalled to office on the retirement of the earl of Sunderland in 1721; and from this time to his final retirement in 1742, the life of Walpole may be said to be the history of England. In 1723 his son was created baron Walpole.

In 1737 his power was a good deal shaken by the disputes which had arisen between the king and the prince of Wales; the latter siding with the opposition, which began to grow very formidable in the questions which arose about this time between England and Spain. Walpole was opposed to war; the grand principle of his action being, according to archdeacon Coxe, "the love of peace;" according to Macaulay, however, his aim was not the peace of his country, but of his own administration. In 1740 a motion was made in the house to petition the king to remove sir Robert Walpole "from his majesty's presence and counsels forever." This motion was negatived by a large majority; but the power of the great minister was evidently shaken. He resigned on Feb. 2, 1742, when he was created earl of Orford, with a pension of £4,000 a year. Charges of bribery were now brought against him, and a committee of investigation was ultimately appointed by the house of commons. It consisted of 21 members, of whom only two were of his own party. The report was against him, but it was unsupported by evidence, and proceedings were ultimately dropped. The rest of Walpole's life was spent in tranquillity and retirement. He died in 1745, aged 68. In private life he was amiable and good-tempered. Love of power appears to have been his ruling motive of action. He had strong common sense, with clearness of political vision, and next to his own interest he had at heart the interest of his country. Doubtless he bribed largely, but as Macaulay says: "We might as well accuse the poor Lowland farmers who paid black-mail to Rob Roy, of corrupting the virtue of the Highlanders, as accuse sir Robert Walpole of corrupting the virtue of parliament."—See Coxe, *Memoir of Life and Administration of Sir Robert Walpole* (Lond. 1798); and lord Macaulay's Essay on *Walpole's Letters to Sir Horace Mann*.

WALPURGA, or **WALPURGIS**, SAINT (otherwise *Walburga*), followed her brothers St. Willibald and St. Wunnibald (sons of a king of the West Saxons), in the time of St. Boniface, from her native country, England, to Germany, to help them in extending Christianity. Willibald established the bishopric of Eichstadt about 741; and Wunnibald, the neighboring convent of Heidenheim about 745, the direction of which last Walpurga undertook, after his death (about 763), as the first abbess, and continued till the end of her own life (778). Her bones, from which, according to the oldest biography, a miraculous healing oil flowed, were transferred to Eichstadt, where a convent was erected in her honor. That old biography was written toward the end of the 9th c. by a monk, Wolfhart, in the monastery of Hasenried, and contained, like all the later legends, which are based solely upon it, only a multitude of marvelous stories of the usual stamp. A somewhat more special significance lies in the trait that Walpurga was not molested by biting dogs, and was in consequence invoked for protection against them and other ferocious animals. The veneration of Walpurga became wide-spread. Throughout all Germany, and even in France, the Netherlands, and England, churches and chapels were dedicated to her, relics of her were shown, and festivals celebrated in her honor. The feast of Walpurga falls properly on Feb. 25; but as in some German calendars it is assigned to May 1, the name of Walpurga has become associated, in a quite accidental way, with some of the most noted popular superstitions. May 1 had been one of the most sacred days of all paganism; it was the time of a great sacrificial festival, and of the old May assembly of the people. For centuries on May 1, informal courts of justice continued to be held, the joyful May procession took place, and the kindling of the sacred May-fire. See BELTEIN. When afterward the old heathen gods had been completely degraded into devils by the Christian missionaries, and when the belief in witchcraft had come in vogue, the Walpurgis-night obtained naturally a notorious significance, inasmuch as, during the night between April 30 and May 1, the witches were held to ride on broomsticks and he-goats to the old places of judgment and sacrifice, in order to enjoy themselves there with their master the devil. Such witch-hills were tolerably numerous in Germany and the neighboring countries. The best-known, however, was the highest point of the Harz, the Brocken, Brocks, or Brocksberg, which has obtained a wide celebrity as the scene of the witches' Sabbath in Goethe's *Faust*.

WALRUS. See MORSE.

WALSALL, a municipal and parliamentary borough, Staffordshire, stands amid pleasing scenery on a small stream, an affluent of the Tame, 8 m. n.n.w. of Birmingham. Its public buildings are accounted more than usually handsome, and embrace a number of churches, a free grammar and other schools, and a number of charitable institutions. The iron manufacture, for which the situation of the town on the edge of the South Staffordshire mineral field affords facilities, is the staple branch of industry. Tanning, currying, the manufacture of harness and harness furniture, and of every description of leather goods, are extensively carried on. Coal and lime works are in operation in the vicinity, and there is an extensive trade in malt. Walsall returns one member to the house of commons. Pop. 71, 49,013.

WALSII, ROBERT, LL.D., 1784-1859; b. Baltimore; educated at the Jesuit college of Georgetown; studied law, but practiced only a short time. He adopted literature as a profession, and in 1811 published the first American quarterly, the *American Review*. This meeting no great success was discontinued until 1827, when it was revived and

edited by Walsh for 10 years. In the mean time he was editor of the *American Register*, the *National Gazette*, and the *American Magazine of Foreign Literature*. From 1845 to 1851 he was U. S. consul at Paris and correspondent of several American papers.

WALSINGHAM, Sir FRANCIS; English statesman, of an ancient Kentish family, third and youngest son of William Walsingham of Seadbury, was born at Chiselhurst, Kent, in 1536. He studied at King's college, Cambridge, and afterward traveled on the continent, where he remained until the accession of queen Elizabeth. Burleigh, with his usual discernment in selecting men of talent, discovered his abilities, brought him into office, and sent him on an embassy to France in August, 1570. He remained in Paris until April, 1573, and discharged diplomatic duties with such consummate skill that he was, on the recommendation of his great patron, appointed one of the principal secretaries of state to Elizabeth. He was also sworn of the privy council, and knighted. In 1578 he was sent on an important embassy to the Netherlands; in 1581 to France; and in 1583 to Scotland. He was, with some reason, regarded by the adherents of Mary, queen of Scots, as the most insidious of her enemies in the English council. He contrived to intercept most of her letters, and after having deciphered them, sent them to their destination, in order to obtain fresh intelligence from their answers. Some of these deciphered letters are preserved in the British museum. Walsingham soon held Mary secure in the toils. Some time previous to Sept., 1583, he had bribed to his service Cherelles, the secretary to the French ambassador Castelnau, in whom Mary placed implicit confidence. Walsingham also won over Gray, the envoy of the duke of Guise and other friends of Mary to James VI. (James I. of England), who employed him to manage his correspondence with his mother and his friends in France. The most secret letters of Mary and of James thus came into the hands of Walsingham. Up to Babington's conspiracy, or, as some have called it, Walsingham's conspiracy, there was no evidence for charging Mary with being accessory to any of the plots formed against the life of Elizabeth. The real fountain-head of this conspiracy, and the chief confederates, were spies in the pay of Walsingham, and all the correspondence of Mary and her friends passed into the hands of Elizabeth's dexterous minister. After the discovery and execution of Babington, etc., Walsingham went to Fotheringay as one of the commission to try queen Mary. She charged him with having forged the correspondence produced against her, when Walsingham rose in his place and solemnly called God to witness that he had not done anything unworthy of an honest man, and that he was wholly free from malice. Elizabeth signed her death-warrant with a jest on Walsingham's hatred of the queen of Scots. She had ordered Davison to bring her the warrant, and when she had signed it she said, "Go; tell all this to Walsingham, who is now sick; though I fear he will die for sorrow when he hears it." Walsingham was distinguished even among the ministers of Elizabeth for acuteness of penetration, extensive knowledge of public affairs, and profound acquaintance with human nature. His administration of foreign affairs was founded on the system of bribery, espionage, and deception. He is said to have had in his pay 53 agents and 18 spies, in various countries; and no minister was better informed of the intrigues of foreign courts. Notwithstanding this diplomatic duplicity, which was then universal among public men, Walsingham's personal integrity and disinterested patriotism are undoubted. He was of strict morals, favored the puritan party, and in his later days gave himself up to religious meditation. He retired from public affairs some time before his death, and resided at his house in Barn Elms, where he died April 6, 1590. Elizabeth was ready enough to acknowledge his diligence, genius, and important services, yet she kept him poor. There remain in the British museum (Harleian MSS.) various letters from Walsingham complaining of his being wholly unable, on his scanty appointments, to support his establishment, though very inadequate to his dignity of ambassador in France. Camden says he died so far in debt that he was buried privately by night in St. Paul's church, without any funeral solemnity. The queen was chary even in conferring honors upon him, for he received nothing but his knighthood, and held no offices when he resigned the charge of foreign affairs. He was married, and his daughter Frances became successively the wife of sir Philip Sidney, of the brilliant and unfortunate earl of Essex, and of the brave soldier, Richard de Burgh, 4th earl of Clanricarde.

WALTER, JOHN, 1739-1812; b. England; was by trade a printer, and in 1780 obtained possession of two patents which Henry Johnson had received for an invention called logography, a method of printing with types containing whole words or syllables and various combinations, instead of single letters. He published, Jan. 18, 1785, the first number of the *London Daily Universal Register, printed logographically*, which, on Jan. 1, 1788, was issued as *The Times or Daily Universal Register*. The invention had no great success; but this paper, *The Times*, became the leading English daily journal.

WALTER, JOHN, 1784-1847; b. London; son of John, the founder of the *London Times*. That paper, when he became its manager, in 1803, had a circulation of only 1000 copies. By 1813 it had increased to 5,000. In 1814 the *Times* began to be printed by steam. Walter was returned to parliament for Berkshire in 1832, resigned in 1837, and was elected for Nottingham in 1841.

WALTER, JOHN, b. London, 1818; son of John. He was educated at Eton and Oxford, and called to the bar in 1847. He represented his father's borough of Notting-

ham as a liberal-conservative, 1847-59; then was elected for Berkshire. He was defeated in 1865, but returned in 1868, 1874, and by a narrow majority in 1880. The *Times*, under his proprietorship, though successful, has scarcely maintained its former influence. He is a large land-holder.

WALTER, THOMAS USTICK, M.D., b. Philadelphia, 1804; studied architecture. Among his designs are the Philadelphia co. prison, Girard college, the U. S. capitol extension, and the new treasury building. He long held the chair of architecture in the Philadelphia Franklin institute.

WALTHAM, a village of Massachusetts, U. S., on Charles river and the Fitchburg railway, 10 m. n. by w. from Boston, has a broad street of handsome residences, and manufactories of bleached cotton goods, hollow iron-ware, machinery, chemicals, boots and shoes, and machine-made watches, of which 10,000 are made a year. Pop. '70, 9,065.

WALTHAM ABBEY, a market t. in the county of Essex, on the banks of the Lea, 13 m. n. of the e. part of London, on the Great Eastern railway. It contains a spacious Norman church, originally belonging to an abbey. The river Lea here divides into several branches, which are made to turn a number of gunpowder and flour mills belonging to government. Enfield Lock, at which is situated the celebrated government factory for rifles, etc. (see **SMALL-ARMS FACTORIES, ROYAL**), is about a mile distant; and many of the hands there employed live in and around Waltham Abbey. A weekly newspaper is published. Pop. '71, 5,167.

WALTHER VON DER VOGELWEIDE, the greatest and most famous minnesinger (q.v.) of the middle ages, was b. 1165-70 in Franconia or in Austria. Although his family was noble, he had no possessions, and became a minstrel as much, perhaps, from necessity as from impulse. His master and early model was the elder Reinmar. It is thought that his first public performances in "singing and saying" date from about 1187; soon after which, he found a warm patron in Friedrich the Catholic, duke of Austria. But this prince having died in 1198, Walther began the life of a wandering minstrel, in the course of which he visited the courts of most of the German sovereigns. A few details of his career are known. He twice (1199 and 1205) spent some time at the court of the emperor Philipp; and then lived six years at Eisenach with a generous patron, Hermann landgraf of Thuringia. During 1214-15 he repeatedly visited the emperor Otho, by whom, as well as by Philipp, he seems to have been treated with unkingly parsimony. From 1217 to 1219 he lived with duke Bernhard in Carinthia, then returned to Austria, and in 1220 received from Friedrich II. a small estate at Würzburg. He died about the beginning of 1228. His grave has long been pointed out in the Laurence garden of the cathedral of Würzburg; but a new monument was erected to him in 1843. Walther far excelled his master Reinmar, whom he survived about 20 years, both in matter and style; while in richness and versatility of mind all the other minnesingers must stand far behind him; for, to his wide sympathies and matured art, all themes were alike: tenderness and depth, no less than cheerfulness and gaiety, deep earnestness, as well as playful raillery. He did not confine himself, like Reinmar, to minnelays, but wrote also hymns, eulogies of his patrons, and didactic pieces. He sang of the duties and dignities of the emperor; of the obligations of princes and vassals; of the rights and wrongs of the question between the pope and the emperor; of the glory of the true church; and often his song conveyed earnest and cutting censure. But it was only on conviction that he gave praise or blame, never influenced by favor or prejudice; and his censures of the church were those of a candid but pious believer. From a decided patriotic feeling, he stood firmly by the empire and the emperor in opposing the pretensions and usurpations of the pope. His writings on this subject had a widespread and powerful effect; they alienated, according to the testimony of a contemporary, Thomasin, thousands from the pope, and determined the politics, so to speak, of the German poets for the whole century. Walther was soon recognized by his contemporaries as the master of lyric poetry; and the traditions of the later minnesinger schools place him among the twelve who, in the emperor Otho the great's time, originated and established the noble art of minstrelsy. Lachmann brought out a masterly critical edition of Walther's writings (Berl. 1827, 3d ed. 1853); and Simrock an excellent translation (with explanations by Simrock and Wackernagel, 2 vols. Berl. 1833; 2d ed. Leip. 1853); Uhland wrote a beautiful account of his life and writings (*Walther von der Vogelweide, ein altdeutscher Dichter*, Stuttg. and Tüb. 1822); and Hornig, a complete *Glossarium* to his poems (Quedlinb. 1844).—See Reuss, *Walther von der Vogelweide* (1843); Dattis (1854), Opel (1860), Rieger (1863), Kurz (1863), and Menzel (1865).

WALTON, a co. in n.w. Florida, having the gulf of Mexico and Choctawhatchee bay on the s.; about 1550 sq.m.; pop. '80, 4,201—4,182 of American birth, 519 colored. Co. seat, Euchee Anna.

WALTON, a co. in n. Georgia; 460 sq.m.; pop. '80, 15,622—15,617 of American birth, 6,298 colored. Co. seat, Monroe.

WALTON, BRIAN, D.D., 1600-61; b. England; graduated at Cambridge, 1619; rector of St. Martin's Orgar, London, 1626; and of Sandon in Essex, 1636. Being involved in

the troubles of the times he was deprived of his rectories; but undismayed, he planned the famous polyglot Bible for which £9,000 were subscribed. He had various learned helpers, but the editorship devolved on himself. The great work was finished in 4 years. It employs in all 9 languages. The four gospels are in six, and the rest of the New Testament in five. At the restoration he regained his preferments, and was consecrated bishop of Chester in 1660.

WALTON, GEORGE, 1740-1804; b. Va.; studied law, and was admitted to the Georgia bar, 1774. He took an active part in the events which led to the revolution; 1776-81, a delegate to congress; at the defense of Savannah was wounded and made prisoner. He was twice governor of Georgia; chief-justice of the state, 1783; judge of the U. S. supreme court, 1793; and U. S. senator, 1795-96. He was one of the signers of the declaration of independence.

WALTON, ISAAK, author of the *Complete Angler*, was the son of one Jervis Walton, a yeoman, and was born at Stafford on Aug. 9, 1593. Of his earlier life not much is certainly known. In the year 1694 we find him settled in Fleet street, London, and carrying on business there as a hosier. In the end of 1626 he married Rachel Floud, a descendant of archbishop Crammer. From George Crammer, her uncle, who had been a pupil and friend of Hooker, it is thought likely that Walton derived much of the material for his life of that eminent man. In Aug., 1640, she died in giving birth to a daughter, having before had two sons, neither of whom survived her. In 1643 Walton retired from business with such a modest competence as sufficed for the simple way of life he affected; and in 1647 he married a second time. The lady was Anne Kenn, half-sister of the well-known bishop of that name. She bore to him a daughter and two sons, only one of whom lived, and died in 1662, to the great grief of her husband, who survived her many years. He died on Dec. 15, 1683, at the great age of 90, in the house of Dr. Hawkins, his son-in-law, prebendary of Winchester cathedral, and was buried in the vault of that sanctuary.

With the celebrated Dr. John Donne, who died in 1631, Walton, who attended his ministry, had been on terms of affectionate intimacy; and on the publication of his sermons in 1640 he was induced to preface them with a life of the author. This, his first publication, was followed by lives of Hooker, sir Henry Wotton, and George Herbert, in succession; the whole four being reissued in a collected edition in 1670. In 1678 the life of his friend, bishop Sanderson, was added. *The Complete Angler, or Contemplative Man's Recreation*, was published in 1655. A fac-simile of the original edition was published in 1675, and, from first to last, more than fifty editions have appeared. To the edition of 1676 a little treatise on fly-fishing was added by Walton's friend, Charles Cotton, in a fishing-house built by whom, on the banks of the river Dove, many of the later days of his happy and blameless life lapsed peacefully in the pursuit of his favorite recreation. *The Complete Angler*, as a treatise on the art of angling, may be regarded as in good part obsolete, but it continues and will continue to be read for its charming simplicity of manner, its pastoral freshness and poetry, and the pure, peaceful, and pious spirit which is breathed from its quaint old pages. The lives, though somewhat less widely known, are in their kind not less exquisite and *unique*. Wordsworth has dedicated to them a beautiful sonnet, in which he speaks of the five saintly names of the subjects of them as

Satellites burning in a lucid ring
Around meek Walton's heavenly memory.

WALTZ (Ger. *Wälzer*, literally, roller), a national German dance, said to have originally come from Bohemia. It first became a fashionable dance in the other countries in the early part of the 19th century. It is danced to music of $\frac{3}{4}$ time by any number of couples, who, with the gentleman's right arm round his partner's waist, wheel rapidly round on an axis of their own, advancing at the same time round the room. Some time ago the *valse à deux temps* was generally adopted—a form of the waltz not so graceful as the older one, because not so correspondent to the rhythm of the music—but this has now given place to the *valse à trois temps*.

WALWORTH, a co. in central Dakota, having the Missouri river for its w. boundary; about 900 sq.m.; pop. '80, with three other counties, 676—484 of American birth, 81 colored.

WALWORTH, a co. in s. Wisconsin, containing Geneva lake, 9 m. long; 576 sq.m.; pop. '80, 26,249—21,503 of American birth, 54 colored. Co. seat, Elkhorn.

WALWORTH, REUBEN HYDE, LL.D., 1789-1867; b. Conn.; lived on a farm, taught school, and in 1809 was admitted to the bar. He began to practice at Plattsburg, and soon rose to a high rank in his profession. During the war of 1812 he was adjt.gen. of the state militia, and took part in the operations about Plattsburg. He was a master of chancery, and served in congress, 1821-23. He became a justice of the circuit court in 1823, and was chancellor of the state, 1828-48. His decisions are reported in Hill, Wendell, Denio, Barbour, and Page. His rank as an equity judge was high. He published *Rules and Orders of the New York Court of Chancery* (1829); and *Hyde Genealogy* (1864).

WAMPUM, a name given to shells and shell-beads, used as money, and worn for ornaments in strings and belts by the North American Indians.

WANDERING JEW, THE. The legend of the wandering Jew, who cannot die, but, as the punishment of his sin, is obliged to wander over the face of the earth till Christ shall pronounce his doom at the last day, seems to have originated in that passage of the gospel of St. John (xxi. 22) where Jesus says of John: "If I will that he tarry till I come, what is that to thee? follow thou me. Then went this saying abroad among the brethren, that that disciple should not die." It arose, probably, in the 13th c., when it is first related by Matthew Paris, and may be supposed to indicate the Jewish people, scattered throughout the world, and nowhere finding a home. According to the current legend, the wandering Jew is Alasuerus, the shoemaker at Jerusalem, who, when the Saviour wished to rest before his house, on his way to Golgotha, drove him away. Another legend states him to be Pilate's door-keeper, Kartaphilus, who struck Jesus on the back as he led him out of his master's judgment-hall. So recently as the last century impostors took advantage of the belief in this legend, and gave themselves out for the wandering Jew; and people were not wanting who, from time to time, maintained that he had appeared to them under different forms. A popular book relating in detail the history of the wandering Jew has been repeatedly printed in the German, French, Dutch, and Latin languages. The legend has likewise been frequently worked up in a poetical form, as by A. W. von Schlegel in the romance entitled *Die Warnung*; by Schubert in his poem of *Alasuere*; by Goethe in *Aus meinem Leben*; by Mrs. Norton in *The Undying One* (Lond. 1842); and by Eugène Sue in his *Le Juif errant*. Compare Gräse, *Die Sage vom Ewigen Juden*.

WANDEROO', a name which has been given to several species of monkey. The species commonly described under the name is *macacus silenus* or *silenus veter*, a native of the coast of Malabar, a monkey of rather large size, deep black throughout, except a ruff of long gray or white hair, from the midst of which the face looks forth, and which descends over the chest, giving the animal a very peculiar aspect. This monkey exhibits considerable intelligence and docility, and performs its tricks with an absurd air of gravity.—The name wanderoo, however, more properly belongs to monkeys of the genus *presbytes*, natives of Ceylon, to which it is given by the Singalese, and appears to have been transferred by mistake to the species just described, which is not found in Ceylon. The wanderoos of Ceylon are all small monkeys. The best-known species is *presbytes cephalopterus*, found in the low parts of the island. It feeds chiefly on the berries and buds of trees, and is seldom seen on the ground. Twenty or thirty are generally found together in a troop. When alarmed, they display marvelous agility in leaping, or rather swinging from branch to branch, using their powerful arms alternately, often flinging themselves obliquely so as to catch the lower bough of an opposite tree, and taking advantage of its rebound to carry them up again till they can reach a higher branch; the females, all the while, being often encumbered by their young, which cling to them. This monkey is far from being so mischievous as monkeys in general. "In captivity it is remarkable for the gravity of its demeanor, and for an air of melancholy in its expression and movements which is completely in character with its snowy beard and venerable aspect."—Tennent's *Ceylon*. Its disposition is extremely gentle and affectionate; it is intelligent and docile, and very cleanly in its habits.—Several other species of wanderoo or *presbytes* are found in Ceylon, some of them in the more elevated parts of the island.

WANIKA, a people of e. Africa, near the coast, from 2° to 6° s. lat., belonging to the Kaffer family. They number about 50,000, and are divided into 12 tribes. They are a simple, inoffensive, timid people, but untruthful, impure, indolent, and superstitious. They believe in good and evil spirits, and offer sacrifices to a fetich, which is a trunk of a tree partly hollowed, and covered with hides. Those living in the vicinity of Mombaz, who have had intercourse with the Mohammedans, have received some of their notions. They put to death feeble and deformed children. There is no supreme ruler, but each tribe has its independent chief.

WANTAGE, a market-t. in Berkshire, in the vale of the White Horse, 26 m. w. of Reading, and 60 w. of London. It manufactures agricultural implements, and has an extensive trade in corn. Pop. '71, 3,295.

WAPELLO, a co. in s.e. Iowa, drained by the Des Moines river; 432 sq.m.; pop. '80, 25,282—22,680 of American birth, 460 colored. Co. seat, Ottumwa.

WAPENSHAW (Sax. *wæpen*, weapon, and *scæwan*, to show), a periodical gathering of the people, instituted by various Scots statutes, for the purpose of exhibiting their arms, these statutes directing each individual to be armed on a scale proportioned to his property. There are numerous Scots acts of the 15th and 16th centuries, regulating the subject of wapenshaws. In the time of war or rebellion, proclamations were issued charging all sheriffs and magistrates of burghs to direct the attendants of the respective wapenshawings to join the king's host. During the reign of the later Stuarts, attendance on the wapenshaws was enforced with considerable strictness; and in addition to military exercises, sports and pastimes were carried on by authority at these gatherings.

The Covenanters, in consequence of these sports being of a kind disapproved of by them, did what they could to discourage attendance on the wapenshaws.

WAP'ENTAKE (Sax. *wæpen*, arms, and *tac*, touch), a name given in Yorkshire to the territorial divisions of the county, similar to what, in most of the other counties of England are called *hundreds*, and in the more northern counties, *wards*. The term has come down from Anglo-Saxon times, where it, in the first instance, signified the assemblies of each district held for the administration of justice and like purposes, at which each vassal attended armed, and "touched" the spear of his overlord, in token of homage. From the assembly the word was transferred to signify the district within which it was convened.

WAP'ITI, *Cervus Canadensis*, a species of deer, nearly allied to the stag, but considerably exceeding it in size, being $4\frac{1}{2}$ ft. in height at the shoulder. It is a native of North America, found as far s. as Carolina, and as far n. as 56° or 57° n. lat. It is yellowish brown on the upper parts; the sides gray; a pale yellowish patch on each buttock, bounded by a black line on the thigh; the neck, a mixture of red and black, with long, coarse, black hair, falling down from it in front like a dewlap; a black mark at each angle of the mouth. The hair is crisp and hard, but there is a soft down beneath it. The antlers are large, much like those of the stag, but the first branch bends down almost over the face. The wapiti is called *elk* and *gray moose* in some parts of America, although very different from the true elk, or moose deer. It is found chiefly in low grounds, or in parts of the forest adjacent to savannas and marshes. Its flesh is coarse and dry. The hide makes excellent leather.

WAPPERS, GUSTAVE; 1803-74; b. Antwerp; studied art in Flanders and at Paris, and became a historical painter of the romantic style. By Leopold I. he was made a baron and director of the Antwerp academy. In 1855 he removed to Paris, where the rest of his life was spent. His best works are, "Christ at the Sepulcher," "Charles IX. on the Night of St. Bartholomew," "Execution of Anne Bolcyn," and "The Great Fishery of Antwerp."

WAR between states or nations, or between parties in the same state (*civil war*), is analogous to club-law (Ger. *faustrecht*), or the law of the strongest, among the individuals of a community, which is the normal state of things where no legal or fixed rights are established, or where there is no authority to enforce them. The prevalence of war among nations is thus an indication of the imperfection, or the total want, of international law. If the sentiment of brotherhood were universally diffused, and a system of international morality established and generally accepted, together with an organization for putting it in force, we can conceive the necessity for war to cease. And although the full realization of this state of things may never be attained, it is nevertheless the ideal goal to which all real progress tends. But it by no means follows that in the present condition of the world, while the sentiment of international justice is yet in embryo, peace at any price is to be preferred to war. When a community is in a state of anarchy, the individual man must take the law into his own hands, and defend his life and his rights with violence if need be; and nations in similar circumstances must do the same. The balance of power (q.v.), the shape in which the sentiment of political morality in Europe seemed at one time trying to crystallize itself, has gone again apparently into chaos.

Wars are various in their occasions and objects, sometimes breaking out in consequence of disputes about territorial possessions or material interests; at other times, having reference to the establishment of some important point of civil or religious liberty. In all cases, the aim of each contending party is to weaken and overthrow the opposing party. At one time the art of war was supposed to consist very much in wearing out the enemy by a slow process of exhaustion, and thus wars were much protracted; but more recently the greatest generals have adopted the method of rather endeavoring to strike sudden and terrible blows, by which the war is sooner brought to a termination; and this method, although it may often have been adopted without regard to considerations of humanity, is, in all probability, less productive of suffering to mankind than the other.

Among rude nations, wars are conducted by tumultuary hosts, suddenly congregated, and in general, either after defeat or victory, soon dispersed. But the wars of the more civilized and powerful nations have long been conducted by armies carefully trained and disciplined; and in the case of maritime powers, by means of fleets at sea as well as of armies on land. Preparation for war among such nations requires not only the forming and training of the army, but vast provision in many various ways of the means and *matériel* of war. Much science and skill are also applied to the conduct of military operations, and the principles upon which they ought to be conducted have been carefully investigated, and theories tested by an examination of the history of the most important campaigns. See STRATEGY, TACTICS.

In the progress of society, certain *usages of war* have come to be generally recognized. These, of course, have varied at different times, and in different parts of the world, according to the state of civilization and the prevalent feelings of the time; they are also subject to modification from causes less general. But the changes which have taken

place in them during the lapse of ages have been in general favorable to the interests of humanity. Prisoners of war are no longer put to death, nor are they reduced to slavery, as was once very frequently the case, but their treatment has become generally more and more mild and kind. It is a well-understood rule, however, that a prisoner of war obtaining his liberty by exchange or otherwise, with the condition of not serving again during a fixed period against the same power, forfeits his life if he is found so serving and is again taken prisoner. Amongst all civilized nations, quarter is granted in battle whenever it is sought; and there are certain usages universally prevalent with regard to the capitulation of fortified places, and of bodies of troops hopelessly hemmed in by superior forces, etc.

War-cries for mutual recognition and encouragement in battle have always been common, each rude nation or tribe having its own. The ancient war-cry of the English was *Saint George!* that of the Spaniards, *San Jago!* and that of the French, *Mourajoie Saint Denis!* In the feuds of the middle ages, each party, or the retainers of each noble family, had a distinctive war-cry. Sometimes the war-cry was the name of the family. Thus, in Scotland, the retainers of the noble houses of Douglas and of Home rushed into battle with the cry of *A Douglas!* *a Douglas!* or *A Home!* *a Home!* The French armies under Napoleon were accustomed to charge with shouts of *Vive l'Empereur!*

The invention of gunpowder has effected great changes in the whole art of war; but the introduction of fire-arms has rendered battles less sanguinary and ferocious than they previously were. While fire-arms were yet unknown, warlike engines of various kinds were employed; but close combat was more general, and often more protracted, and the passions of the combatants had thus in ordinary battle more of that exasperation which fearfully characterizes the storming of a town. See **INTERNATIONAL LAW**.

WAR DEPARTMENT, the entire administration of the military affairs of the nation. It includes the purely military command under the **COMMANDER-IN-CHIEF**, and the civil administration under the surveyor-general of the ordnance, and the financial secretary. This latter includes the manufacture of warlike stores, and their custody; the formation of defensive works; the paying, feeding, punishing, curing, arming, carrying, etc., of the army. The national surveys form also a part of this department. The whole department is controlled by the secretary of state for war. See **WAR OFFICE**.

WAR OFFICE, the immediate office of the secretary of state for war, and the center on which pivots the entire administration of the army. It is divided by the "war office act" of 1869 into three great departments—the military, the ordnance, and the finance—under respectively the officer commanding in chief, the surveyor-general of the ordnance, and the financial secretary. All are ultimately responsible to the secretary of state for war, who has, for his immediate assistance, one parliamentary and one permanent under-secretary of state.

WAR-OFFICE REGULATIONS consist of the royal warrants regulating the pay, retirement, and allowances of officers and men of the army, together with the instructions to paymasters and others considered necessary for the proper carrying out of the warrant.

WAR-SERVICES. The science of destruction had made such rapid progress during the publication of the *Encyclopædia* that to render the more important descriptive articles complete it was necessary to add a few words to bring the information down to the standard of 1868. The articles most requiring supplement were the following, in their alphabetical order. (The still more recent state of things will now be found in the several articles in the body of the work).

ADMINISTRATION, MILITARY.—This is the comprehensive title for all that complicated machinery by which the military force and energy of a nation are endowed with cohesion and vitality. The expression staff (q.v.) applies in a somewhat similar sense to the governing and ministering center of a specific army, but is as much inferior to the general military administration as a single army is less than the country's aggregate military strength. In every nation the head of the whole administration is the minister of war, whatever exact title he may bear. Under him are the great officers charged with superintending the discipline, payment, and supplies of the army or its parts wherever situated; the military manufactures and the national reserves. It is not necessary here to specify the various sub-departments under these chief officers; but there is, at headquarters, a section representing each civil department serving with the army, and charged with the duty of directing and supplying that department with all things required to maintain its efficiency.

ADMIRAL.—The distinction of flag—red, white, or blue—has been abolished, and the flag-officers now constitute three classes only—viz., admirals, vice-admirals, and rear-admirals, all carrying the white ensign and pendant, and the St. George's cross on a white ground as their distinguishing flag, hoisted according to rank at the main, fore, or mizzen mast-head respectively.

AMBULANCE CORPS.—The functions of this body of men are at present undertaken by the army service corps in the British army.—In the French army the duty is confided to a section, specially trained, of the *train des équipages militaires*.

ARTILLERY, ROYAL REGIMENT OF.—The terms battalion, company, and troop have

been abolished in favor of brigade and battery. There were in the artillery of the regular army in 1879-80 over 34,500 men, thus distributed:

Royal Horse	{ 15 batteries for service.
Artillery.	{ 3 depot batteries.
	{ 15 batteries serving in India.
	{ (1) Field artillery—
	{ 36 batteries, home service.
	{ 3 “ colonial service.
	{ 6 depot batteries.
	{ 43 field batteries serving in India.
Royal Artillery.	{ (2) Garrison artillery—
	{ 37 batteries for home service.
	{ 29 “ for colonial, etc., service.
	{ 5 depot batteries.
	{ 28 batteries in India.

See also ARTILLERY, ROYAL REGIMENT OF.

BALLISTIC PENDULUM.—The use of this apparatus as a test of the initial velocity of projectiles has nearly ceased, its place having been taken by the electro-ballistic apparatus of maj. Navez, a distinguished Belgian officer. This apparatus consists of a pendulum moving on a graduated arc of a circle, at a known velocity, at the top of which it is held by an electro-magnet. The projectile is fired through two screens at a known distance apart. In passing through the first screen it breaks the electric circle and demagnetizes the magnet, causing the pendulum to fall. As the ball passes the next screen it restores the circuit and the magnetic power, instantly arresting the pendulum in its downward course. The portion of the circle passed over by the pendulum shows the time occupied by the ball in passing from screen to screen; and that distance being known, the initial velocity becomes a question of very simple calculation. Of course the magnet and the two screens are connected by wires with a voltaic battery.

BARRACKS.—The office of barrack-master-general had been abolished in 1822, and the duties transferred to the board of ordnance. On the extinction of that board in 1855, barracks came under the control of the secretary of state for war, who confided the executive to two departments of his office—the director of works in regard to buildings and lands, and the superintendent of the barrack department in regard to the personnel. The system of government was so far altered that all the barrack-masters in any military district were supervised by one of their number, who ranked as district barrack-master. The correspondence of the whole district with the war office was conducted through this officer. Barrack-masters were granted relative rank and increased pay, with some other minor advantages.—For the most recent changes, see BARRACKS.

BOOTY.—A very important decision was given by Dr. Lushington, judge of the court of admiralty, in 1866, on the subject of the degree of co-operation which entitled combatants to share in booty. The case arose on the question of the Banda and Kirwee prize money, captured in 1857-58 by the central India field-force; and, speaking broadly, the decision was that only those divisions of an army could share the booty which were either directly concerned in its capture, or contributing to that operation by co-ordinate fighting within a reasonable distance of the principals. This excludes those portions of the army which inferentially contribute by keeping the enemy employed in other theaters of war. The commander-in-chief of the whole army, with his general and personal staff, take a share as well as the staff immediately in command of the capturing division. In the case in point the capture was made in central India, and the divisions at Delhi, the Punjab, and Oude were held to be excluded.

BREVET.—General promotion by brevet has for many years been abolished in the navy, and in 1854 was abolished for the army. Brevet rank can at present be obtained in three ways only, and never extends above the grade of col. Captains or majors may receive brevet promotion for distinguished service before the enemy. Lieut. colonels have brevet promotion to col., after commanding battalions or holding certain staff appointments for five years. When a general officer dies, the senior maj. and capt. in the army receive each a step of brevet rank. Surgeons of twenty years' total service (or of less service for distinguished conduct) receive brevet rank as surgeons-maj. These are the only modes in which brevet rank can be obtained. In the United States army, however, brevet rank is given in any grade; and we find officers with the puzzling title of "brevet-maj.gen."

BRITISH NAVY.—In 1859, the navy was made a steam-navy, and sailing-vessels of war ceased, practically, to exist. No sooner was this accomplished, at great expense, than, at a still more enormous outlay, it was found necessary again to reconstruct the navy by building vessels more or less encased in iron plates, varying in thickness from $4\frac{1}{2}$ to 7 inches. These are for the most part already obsolete. The British fleet now consists of between 300 and 400 war-ships; and in 1879, 64 of these were iron-clads. The most important section of the iron-clads is nowadays the turret-ships, of which there were in all 16 in the same year. The first class of war-ships consisted of 4 iron-clad turret ships, with armor plates varying from 12 to 14 (or more) in. thick. The second class con-

sisted also of turret-ships, 9 in number, and mostly with armor from 10 to 12 in. thick. The remaining three classes are all rigged ships. See **BRITISH NAVY**; also **TURRET-SHIP**.

CANNON.—The service ordnance now in use in the British army and navy is divided into two great classes—viz. (I.) muzzle-loading rifled guns; and (II.) breech-loading rifled guns. I. All our guns of heavy caliber belong to the first class, and their dimensions range from the 80-ton gun of 16 in. caliber (taking a charge of 370 lbs. of powder and a Palliser shell, weighing, when empty, 1700 lbs.), down to the 7-pounder of 3-in. caliber, weighing only 150 lbs. A gun of 100 tons weight has recently been turned out of the royal factory at Woolwich, and underwent trial in 1879. This class of guns, again, is divided into four kinds—viz. (1) armor-piercing; (2) medium; (3) field and siege; and (4) rifled howitzers. II. In the second class there are nine varieties, varying from the 7-in. gun of 4 tons 2 cwt. to the 6-pounder of 3 cwt. In addition to the above, there are in all fortresses and in many ships numbers of the old cast-iron ordnance, for which the new guns are in course of substitution.

CANNON-FOUNDING.—Guns, whether of iron or brass, have ceased to be cast at Woolwich. All new guns are now formed of iron or steel bars, wound while red-hot into a coil round a mandril, and welded together into a solid barrel. Such a coil never bursts explosively.

CLOTHING, ARMY.—All uniforms are now issued to the soldier without charge against him. It is merely for the renewal of "necessaries" that the price is debited against him, the price being precisely the wholesale cost to government, and far less than that at which the soldier could purchase it.

COAST-GUARD has been organized under the chief direction of a controller, who has the rank of commodore, and is at the head of a department at the admiralty.

COLONEL.—The colonelcy of a regiment is always held, as a sinecure, by a general officer, who receives £1000 a year in line regiments, and somewhat higher pay in the guards, the best appointment being to the grenadier guards at £2,300. The rank of col. when held by an officer who is not a general officer, is always, except in the artillery, and engineers, brevet or army rank, carrying no regimental function or precedence with it.

COLONIAL CORPS.—Of those mentioned in the original article, the following were disbanded by 1868: Newfoundland veterans, Ceylon invalids, St. Helena regiment, Gold Coast artillery, Falkland Islands company. On the other hand a fourth West India regiment was added; and a second battalion of the Ceylon rifles was in course of formation for service in the Straits' settlements and in Hong-kong. The Malta fencibles have been converted into a corps of artillery, and are highly efficient. For the latest changes, see **COLONIAL CORPS**.

CONTROL DEPARTMENT.—sometimes called the **CONTROL DEPARTMENT**, a presiding civil department of the army, the creation of which furnished ground for much public controversy throughout 1857, and for much misapprehension since the appointment of a controller-in-chief to the war-office in Jan. 1863. The common idea seemed to be, that this officer, who held high rank in the military hierarchy, was to control the whole war-office, and consequently the minister of war himself. His title was not a very felicitous one; but his functions were merely to control the departments charged with army supplies—that is, the commissariat, store, purveyors, transport, and barrack departments. The appointment was the result of an inquiry in 1866 and 1867 by a committee of officers, of whom lord Strathnairn was chairman. The recommendation was, that the departments specified should not only be concentrated at head-quarters; but that in every command there should be a controller, or deputy or assistant controller, according to the importance of the charge, whose duty it should be to harmonize the same departments within the command. It was the corporation formed by the controller-in-chief and these local controllers which constituted the control department. (The department was formed in 1870. The controller-in-chief was in the same year replaced by the surveyor-general of the ordnance, a parliamentary officer under the war secretary. In 1875, the united control department ceased to exist, and was divided into a commissariat department and an ordnance store department.) See the article **COMMISSARIAT**, and the article **ORDNANCE DEPARTMENT**.

CROSS, VICTORIA.—This distinction is also applicable to the navy.

DEPOTS.—There are as many depots as there are battalions, the depots being maintained for the sake of training and recruiting at the new depot centers. The headquarters of the battalion are not at the depot, but with the service companies. Each battalion has two companies at the depot, and in time of war these would be the nucleus of a third battalion for that particular sub-district. See **DEPOT**.

DOCKYARD BATTALIONS no longer exist, with the exception of a small corps at Malta.

ENLISTMENT, ARMY.—By an act of 1867 the first period is fixed at 12 years, and the second at 9 years, for all arms of the service. Men are also empowered and encouraged to enlist for general service as distinguished from enlisting for particular regiments.

ENSIGN.—The use of the white ensign is now peculiar to the British navy; the red ensign being assigned to yacht-clubs and non-combatant government vessels; and the blue ensign to vessels of the merchant service.

FIFER.—A fifer now receives pay at 1s. 1d. a day; and a fife-major, 1s. 11d.

FLEETWOOD.—The school of musketry at this port has been discontinued.

GUN-CARRIAGES.—In consequence of the great weight of modern artillery, and the enormous strain produced by its discharge, it has been found cheaper and more efficient to construct carriages of wrought iron for all naval and garrison guns of or exceeding 6½ tons in weight.

GUN FACTORIES, ROYAL.—The establishment of sir William Armstrong & Co. at Elswick has ceased to be connected with government. When, in 1863, the government work was withdrawn, a sum of £85,000 was paid to the company as compensation for the plant, etc., they had set up for the purposes of the manufacture.

LAUNCH (boat).—The launches of the largest ships of war are now usually decked vessels, fitted with steam-engines, and capable of cruising and fighting on their own account. They are hoisted inboard when the ship is on her course.

MUSKETRY, SCHOOLS OF.—The school at Fleetwood has been discontinued, duplicate establishments being found an unnecessary expense.

PALLISER GUNS AND PROJECTILES.—Since the issue of that portion of the *Encyclopædia* devoted to great guns, a considerable step in advance has been taken under the auspices of maj. Palliser, a cavalry officer on half-pay. His guns have resisted charges that would have instantly shattered any others yet brought forward; and by the aid of his hardened projectiles, shields have been pierced which had defied the heaviest bolts of all other ordnance. Although only prominently before the public during the last few years, this indefatigable officer has been experimenting from time to time since 1854, always in the one direction. Cavalry service in the Crimea and in India interrupted the investigations, but they were resumed when opportunity offered. The principle of maj. Palliser's gun is readily understood.

With the large charges used in this country, cast-iron guns were unequal to projecting modern shot and shell, and wrought-iron ordnance were introduced. These answered their purpose to a certain extent, as in the Armstrong and other guns; but there was an element of uncertainty in their texture, and some of them had burst with bad effects. To this might be added their enormous expense; and the fact that thousands of large cast-iron guns were in store, to all appearance useless. Many attempts have therefore been made to utilize these cast-iron guns, the means adopted being generally to shrink rings of wrought iron over them. This has not proved effectual, and the guns have become preposterously cumbrous. Next, the cast-iron guns were bored up to a greater caliber, and then a thinner cannon (called a tube) was inserted, this tube being a cylinder of wrought iron or steel, bored to the proper caliber. The strength thus added to the gun has been but little. Maj. Palliser's system for converting guns is to insert a tube of wrought iron; but that tube is *coiled*, as in an Armstrong gun, by winding a bar of iron round a mandril, and then welding it into a continuous barrel. These guns have withstood the utmost strain brought to bear upon them. For the preferable and cheaper process of making new guns the iron would be cast in the ordinary way around the wrought-iron tube. For the purpose of this tube maj. Palliser finds the softest and most ductile wrought iron the best, having a certain stretch in it. The authorities had already found out that thick iron plates could not be penetrated except by steel projectiles; but their use was greatly limited by their great cost. Maj. Palliser came, by experiment, to the conclusion, that toughness was not a necessary feature in the shot, and that hardness—no matter how brittle the material might be—was the real thing necessary for extreme penetration. With this view, he selected white iron, and cast it *in chill*, which secures the requisite amount of brittle hardness. To cast in chill, an iron mold of the exact shape is employed, with raised studs of sand inside it. The liquid metal is poured in (the sand studs forming holes for the studs of the future shot or shell to be fixed in); and the rapid conduction of heat by the iron mold causes so sudden a cooling from the outside of the mass that the particles of iron are driven closer together than in their normal state. This produces intense hardness. The same inventor has ascertained the proper shape for the head of a shot or shell, as opposed to the flat head, the pointed conical head, and the hemispherical head already in use. He determined that the form of greatest power is the *conoidal*, which lies between the conical and the hemispherical, the conoid consisting of the intersection of two circles, each with a radius equal to twice the diameter of the projectile.

RECRUITING.—The competition of the labor-market at home and abroad telling very disadvantageously against the recruiting-sergeant, a royal commission was appointed in 1866 to consider by what means the evil might be lessened. Although all the recommendations of the commission have not been adopted, several have taken effect. Among others, an inspector-general has been appointed to superintend and harmonize all the recruiting operations; to render the conditions of service more attractive, the pay of every soldier has been increased twopence a day, with an additional penny in prospect, if he continue to serve after the expiration of his first period of service. In 1872-73 further changes were made. See RECRUITING.

RESERVE FORCES OF THE UNITED KINGDOM.—By two acts of 1867—one for an "army reserve" of 50,000 men, and the other for a "militia reserve" not exceeding one-fourth the number of militia—power has been given to organize a more effective body of trained men of previous good service in the army or militia, who shall be immediately

available, in case of invasion or imminent danger, for being drafted for the period of danger into the regular army. It was for a time understood to be under contemplation to allow soldiers to commute their last five years of army service into a double period in the army reserve, which would leave them at liberty, under restrictions, for civil employment, without depriving the country in any exigency of their services as soldiers. (See, however, the article RESERVE.) With a view to harmonize the several constituents of the reserve, and to give them that corporate organization which is still wanting, a high officer, the inspector-general of reserve forces, was appointed at the war-office.

There has at times arisen in the country the feeling, expressed in 1867 by Lord Elcho in the house of commons, that every citizen should be ready to bear arms in defensive war; and that, with this view, every young man should serve for two years or some other short period with the army on home service. That such a measure would raise the character of the army, while it diminished the cost of recruiting, it is impossible to doubt.

RIFLED ARMS.—Adverting here simply to the system adopted for rifling—whether by grooves or otherwise—the bore of the gun or rifle, and irrespective of the construction of the arm in other particulars, the scientific inquiries of the government may be said to have been brought to a close.

In small arms the competition long lay between the Enfield, Lancaster, and Whitworth systems. Of these, taking all considerations into account, it was held that the Enfield system was incomparably the worst; and the Lancaster system of oval bore the best. In 1871, however, a special committee appointed to consider the merits of the various breech-loading rifles, decided that, out of 104 different kinds of breech-loading small-arms, the Henry .45 inch bore barrel was the best adapted to the requirements of the service. The Martini breech was adopted along with the Henry barrel, to form the new small-bore rifle of the British army, known as the Martini-Henry. See **RIFLED ARMS**.

In great guns, after protracted experiments with the systems which gave the most favorable prospects—viz., those of Armstrong, Whitworth, Lancaster, Scott, and the French rifling—it has been decided to give the preference to the French plan, with the exception that the grooves are wider and shallower. All rifled cannon now made in the royal arsenal are constructed on this system, which is called the "Woolwich" system, with a variable number of grooves according to the caliber of the piece.

RODMAN GUN.—This has been extensively used for large ordnance (smooth bore) in America, and is said to stand heavy charges. The guns are of cast-iron, cast hollow, and then cooled from within, the process producing great hardness round the bore. A 15-inch gun was tried in 1867 at Shoeburyness; but the results, though on the whole not unfavorable, were scarcely such as would lead to its introduction in the British service. It has been suggested that a Rodman gun lined with wrought iron on Palliser's system would prove a highly effective weapon. See **UNITED STATES ARMY**; **UNITED STATES NAVY**.

WARASDIN, capital of a co. in the Austrian kingdom of Croatia, upon the right bank of the Drave, and 28 m. n.e. of Agram. It is to some extent fortified, is surrounded by straggling suburbs, and contains nine churches, a few convents, and a gymnasium. Silk-spinning is carried on; and stoneware, wine, and tobacco are manufactured. Pop. '69, 10,623.

WARBECK, PERKIN. See **HENRY VII.**, *ante*.

WARBLER, a popular name often applied to all the birds of the family *sylviadae* (q.v.), many of which, however, commonly receive other popular names, as the black-cap, nightingale, hedge-sparrow, redbreast, redstart, stone-chat, wheat-ear, white-throat, etc. (q.v.), while many receive the name warbler with some adjunct. Several British species, commonly thus designated, belong to the genus *salicaria*, others to the genus *sylvia*. The species of the former genus have the tail rounded; in the latter, it is almost square or a little forked. The *salicariae* are also inhabitants of moist situations, whence they are known as *sedge warblers* and *reed warblers*; the *sylviae* are inhabitants of woods. Of the former genus is the GRASSHOPPER WARBLER (*salicaria locustella*), not unfrequent in many parts of England, and found also in the s. of Scotland and in Ireland. It is found in most parts of the center and s. of Europe, at least during summer, being partially a bird of passage. It is of a greenish-brown color, the centers of the feathers dark brown, producing a spotted appearance; the lower parts pale brown. It is a shy bird, hiding itself in hedges and bushes, but very active, often darting out like a mouse from the bottom of the hedge, and receives its name from its chirping, grasshopper-like note.—The **SEDGE WARBLER** (*salicaria phragmitis*) is the most common British species of *salicaria*, and is generally found in thick patches of reeds or willows in marshes, or in other situations close to water, and where the aquatic herbage is thick and strong. It abounds on the marshy banks of the Thames. It is of a brown color, exhibiting various shades, finely intermixed; the chin and throat white; the under parts buff color.—The **REED WARBLER** (*salicaria arundinacea*) is found in summer in marshy situations in the s. of England; it abounds in Holland and in many parts of Europe, and its range extends to the n. of India. It is of a uniform pale brown, with a tinge of chestnut; the chin and throat white; the under parts pale buff color. Its nest is

remarkable; it is attached to the stems of three or four reeds, and formed by winding the branches of their panicles together with a little wool; and is conical and deep, so that the eggs or young may not be shaken out when the reeds are shaken by the wind.—The WOOD WARBLER, also known as WOOD WREN (*syllvia sylvicola*), is common in the wooded districts of England in summer, particularly in old plantations of oak and beech. It is olive green, tinged with yellow, the wings brown, the primaries and secondaries edged with bright yellow, the tertials with a broader edge of yellowish white; the lower parts yellow and white.—The WILLOW WARBLER (*syllvia trochilus*), is very common in the s. of England in summer, but more rare in northern parts of Britain. It frequents woods, shrubberies, thick hedgerows, and bushes; but builds its nest on the ground. It is of a dull olive-green color, the wing and tail feathers dark brown, the wing-feathers edged with green; the under parts whitish, slightly tinged with yellow. The tail is slightly notched. There are other British species of more rare occurrence.—Numerous species of warblers are found in North America, migratory birds, which spend the winter in more southern regions. Not a few of the same species are therefore reckoned among the birds of the West Indies. Some of the European species are in like manner found in Africa; and Asia has many species of warblers, among which some of the European species are included. Australia has many species of warblers, some of which are of very beautiful plumage.

WARBURTON, ELIOT BARTHOLOMEW GEORGE, 1810–52; b. Ireland; educated at Cambridge; admitted to the bar, but devoted himself to the care of his estates in Ireland, to travel and literary pursuits; traveled in the east, 1843, and published on his return, *The Crescent and the Cross, or Romance and Realities of Eastern Travel*. He settled in London, and published: *Reginald Hastings*, a romance; *Memoir of Horace Walpole and his Contemporaries*; *Hocheluga*; *Dorien, or the Merchant Prince*, a historical romance. While on a voyage to the West Indies in 1852 he perished in the burning of the steamer *Amazon* off Land's End.

WARBURTON, WILLIAM, a distinguished English divine, commonly known as bishop Warburton, was born at Newark, in the county of Nottingham, on Dec. 24, 1698. He was the eldest son of George Warburton, an attorney of that place, who claimed descent from an old Cheshire family. Young Warburton received his education at the school of his native town, and afterward at Oakham in Rutlandshire, which he left in the year 1714, returning home to pursue the profession of his father, who had died some years before. Having served the necessary apprenticeship, he practiced as an attorney at Newark for some years, but with no distinguished success. His natural bent was toward literature; and he had all along expressed a desire to take orders in the church of England. Finally, he quitted the legal profession with this object in view; and having gone through the necessary course of study, he was presented by sir Robert Sutton, in 1728, to the rectory of Brand Broughton, in the diocese of Lincoln, where he remained for many years. After publishing some comparatively unimportant pieces, he issued, in 1736, a treatise, entitled *The Alliance between Church and State; or the Necessity and Equity of an Established Religion and a Test Law*. This work, which is still recognized as one of the most masterly statements of the subject from the point of view of the writer, drew great and immediate attention; and in January, 1737–38, it was followed by the first volume of the *opus magnum*, on which his fame as a theologian must mainly continue to rest. This celebrated work, *The Divine Legation of Moses, demonstrated on the Principles of a Religious Deist, from the Omission of the Doctrine of a Future State of Rewards and Punishments in the Jewish Dispensation*, though it encountered a storm of adverse criticism, to which the writer thought it necessary to reply in *A Vindication*, etc., at once established the position of Warburton as one of the most potent intellects of the period; and though its main argument has since been extensively discredited as more or less "precarious," not the less the book, in virtue of its vast learning, its vigor, and originality, will always maintain its reputation as one of the masterpieces of the great period of our English theology. In 1739, a new and revised edition of the first part of the work appeared. This was followed, in 1741, by the publication of the second part; and the third and concluding section, rather supplementary to the argument than essential to it, was only given to the world after the death of the writer.

Becoming involved in the controversy which followed the appearance of Pope's *Essay on Man*, Warburton undertook the defense of the poet, and, in 1739–40, issued a series of seven letters, entitled *A Vindication of Mr. Pope's Essay on Man, by the Author of the Divine Legation*. The poet was much gratified; and between him and his vindicator a warm friendship was the result, which only terminated with the death of Pope, in 1744. He died, bequeathing to Warburton one-half of his library, and such profit as might accrue from any edition of his works published after his death. To Pope, Warburton was indebted for opportunities of cultivating the friendship of some of the most distinguished men of the time—among others, of the well-known Ralph Allen, of Prior park, near Bath, to whose niece, Miss Gertrude Tucker, he was married in 1745.

Though Warburton's important services to literature and religion were admitted, they did not for a long time bring him any very great recognition in the way of substantial preferment. On the appearance of *The Divine Legation*, indeed, he had been appointed

chaplain to the prince of Wales; and in 1746, nearly ten years later, the society of Lincoln's inn unanimously elected him to be their preacher. In 1757, he was promoted to the deanery of Bristol; and finally, in 1760, Mr. Pitt, afterward earl of Chatham, bestowed on him the bishopric of Gloucester, declaring that "nothing of a private nature, since he had been in office, had given him so much pleasure" as this exercise of his patronage. In the later years of his life his mind became seriously impaired; and he was utterly prostrated by the loss of his only son, whom he did not long survive. He died on June 7, 1779.

Warburton was a keen polemic, and deeply engaged in all the intellectual warfare of his time. In nearly everything he wrote, there is the impress of a vigorous and fertile mind, with an arrogance of tone, which tends, in his treatment of adversaries, to degenerate into truculence and scurrility. In addition to those already mentioned, it seems sufficient to give the titles of a few of his more notable performances. In 1750 appeared his *Julian, or a Discourse concerning the Earthquake and Fiery Eruption which defeated that Emperor's Attempt to rebuild the Temple at Jerusalem, apropos of Dr. Middleton's Inquiry concerning the Miraculous Powers of the Christian Church*. Shortly after came two volumes entitled *The Principles of Natural and Revealed Religion occasionally Opened and Explained*; and in 1755, *A View of Bolingbroke's Philosophy, in a Series of Letters to a Friend*, which was held to be much the ablest of all the answers to Bolingbroke which appeared. In 1757, he attacked Hume, in a publication entitled *Remarks on Mr. David Hume's Natural History of Religion by a Gentleman of Cambridge, in a Letter to the Rev. Dr. Warburton*. The blind deceived no one; and if we may estimate the success of the attack by the annoyance it gave the philosopher, his allusion to "that low fellow Warburton" may be held to indicate success. In 1747, he went somewhat out of his way to issue an edition of Shakespeare, with notes critical and emendatory, which last, though ingenious, and occasionally happy, did not greatly add to his reputation. A complete and splendid edition of his works was published in 1788, at the expense of his widow, by his friend, bishop Hurd, who prefaced it with a biography.

WARD, in law, in the feudal system, the minor heir of a tenant *in capite* of the king. The expression was extended to all minors under guardianship. A ward under guardianship can bind himself by contract only for necessities. The guardian stands *in loco parentis* to his ward. The ward is entitled to an account by the guardian of the latter's administration of the estate. See GUARDIAN.

WARD, ARTEMUS. See BROWN, CHARLES FARRAR, *ante*.

WARD, EDWARD MATTHEW, R.A., an eminent painter of the present century, was b. in the year 1816, in London. He early displayed a taste for art, and was educated in a way to develop it. In 1834 he was sent to study at the Royal academy; and two years after, he went to Rome, where he remained for some time, gaining, in 1838, a silver medal, given by the academy of St. Luke. He returned to England in 1839, making on the way a short visit to Munich, where he had lessons in fresco-painting from the celebrated Cornelius. After his return he annually exhibited pictures at the Royal academy, though for some years without any very decisive recognition. In 1843 he competed unsuccessfully for the decoration of Westminster hall and the houses of parliament, his large cartoon specimen, "Boadicea," being generally adjudged a failure. In the same year, however, he made a very "palpable hit" by his picture, familiar to every one as engraved, "Dr. Johnson Perusing the Manuscript of the *Ficar of Wakefield*." His steady progress thenceforward, in the estimation of connoisseurs and the public, is sufficiently marked by the fact that in 1853, having previously, as we noted above, failed in the public competition for the work at Westminster, he was solicited by the fine-arts commissioners to aid in this national undertaking. Of the eight pictures which he engaged to furnish, two were done in oils and two in water-glass. The merit of all eight is unquestioned; and one of them in particular, "The Last Sleep of Argyll," is ranked by competent judges as one of the most masterly works in this kind which our country has yet produced. In further recognition of his merits, Mr. Ward was, in 1847, elected an associate of the Royal academy; and in 1855 he attained the full honor of academician. Of the works of an artist so well known, it would be idle to attempt a catalogue. A few of the more notable are—"The Fall of Clarendon," "Interview between Charles II. and Nell Gwyn," "The Royal Family of France in the Prison of the Temple," "Charlotte Corday led to execution," "Jeanie Deans," "The Earl of Leicester and Amy Robsart," "Juliet and the Friar," "Luther's First Study of the Bible," "Baxter and Jeffreys," and "Dr. Goldsmith." In technical execution, Ward is a master; but he often fails a little on the side of penetrative power and imaginative realization. He died from a wound inflicted by his own hand, Jan. 15, 1879.—His wife, HENRIETTA WARD, is also favorably known as a painter, and is the grand-daughter of James Ward, R.A.

WARD, FREDERICK TOWNSHEND, 1811-62; b. Mass.; educated at Salem. During the Crimean war he was a lieut. in the French army and saw considerable service. He also served in the Mexican war, and was one of the members of Walker's filibustering expedition. He afterward entered the Chinese service, gained several victories, and was killed near Ningpo in a fight between the European allied forces and the insurgent Taepings.

WARD, HENRY AUGUSTUS, b. N. Y., 1834; educated at Williams college and at the Lawrence scientific school, Cambridge, where he was for some time prof. Agassiz's assistant in zoology. He subsequently studied in Paris and Freiberg; traveled extensively in the east and in Africa, exploring the river Niger. As a mining engineer he was employed in the far western states, and visited South America and the West Indies; he was also naturalist to the Santo Domingo expedition of 1871. From 1861 to 1866 he was professor of natural sciences at Rochester university, where he established extensive collections of fossils and geological specimens.

WARD, JAMES, 1769-1859; b. London; began life as an engraver; became a painter of the school to which Morland belonged, whom he is said to have copied; member of the academy, 1811. "The Alderney Bull, Cow, and Calf," in the national gallery, is considered a masterpiece. He excelled as a painter of rural subjects.

WARD, JOHN QUINCY ADAMS, b. Ohio, 1830; studied medicine, but in 1850 entered the studio of H. K. Brown, the sculptor, and after studying art there for six years, went to Washington, and in 1861 opened a studio in New York. His best known works are the bronze statues in Central park, "Shakespeare," "Private of the Seventh Regiment," "Fitz-Greene Halleck" and the "Indian Hunter." In 1874 he was made president of the National academy of design.

WARD, NATHANIEL, 1570-1633; b. England; graduated, Cambridge, 1603; bred a lawyer; traveled on the continent; studied theology; rector of Standon, Massy, Essex, 1626; suspended by Laud for non-conformity, 1633; came to America, 1634; colleague pastor of Thomas Parker, and afterward of John Norton, at Ipswich, 1634-37; published *Body of Liberties*, the first code of laws enacted in New England, adopted, 1641; took part in the settlement of Haverhill, Mass., 1640; returned to England, 1646; pastor of Shenfield, 1648. He published *The Simple Cobbler of Agawam*, a politico-religious satire; *Mercurius Anti-mechanicus*, or the *Simple Cobbler's Boy with his Lap-full of Catechisms*. He was a famous wit, and something of a poet.

WARD, SAMUEL, 1725-76; b. R. I.; son of Richard, governor of Rhode Island. He served in the assembly of the colony, 1756-59; was chief-justice, 1761; governor, 1762 and 1765-67. He was active in the cause of the colonies, a member of the committee of correspondence, and of the congress at Philadelphia in 1774-75. He was one of the founders of Brown university.

WARD, SAMUEL, 1756-1832; b. R. I.; educated at Rhode Island college. He accompanied Arnold's expedition against Quebec in 1775; was captured, and remained a prisoner till 1776. He afterward served in New Jersey and elsewhere. Settling in New York, he became a merchant and acquired a considerable fortune. He was a member of the Hartford convention.

WARD, WILLIAM, 1769-1823; b. England; was a printer; studied theology; became a Baptist preacher; was sent by the Baptist missionary society as a missionary and printer to India, 1799; forbidden by the East India company to remain at Calcutta, he settled at Serampore; printed the Bengalee New Testament and other translations of Dr. Carey; visited England, Holland, and the United States, 1819; returned to Serampore, 1821. He published, besides other books, *An Account of the Writings, Religion, and Manners of the Hindus, including Translations from their Principal Works*, 4 vols., reprinted in England and the United States.

WARD, WILLIAM HAYES, D.D., b. Mass., 1835; graduated, Amherst college, 1856, and Andover theological seminary, 1859; ordained a Congregational minister, 1859; supplied two churches in Kansas; teacher of natural science, Beloit college, 1857-58; and in Utica free academy, 1862; professor of Latin, Ripon college, Wis., 1865; became a member of the editorial staff of the *New York Independent*, 1868; superintending editor, 1870, which position he still occupies. Dr. Ward has given special attention to oriental studies, has read valuable papers before the American oriental society, and contributed articles in the *Bibliotheca Sacra* on Assyriology; in these departments he has made extensive research, and holds high rank among scholars. As an editor he is vigorous, incisive, and with broad scope of thought.

WARDEN, an officer appointed for the naval or military protection of some particular district of country. In order to keep the districts of England adjoining to Scotland and Wales in an attitude of defense, great officers, called lords wardens of the marches, were appointed, to whom the duty of protecting the frontier was committed. From this source originated the name *ward*, applied to the subdivisions of the counties of Cumberland, Westmoreland, and Durham—a term afterward extended to divisions of a city, town, or burgh adopted for municipal purposes. The custodian of Dover castle was created by William the conqueror warden of the Cinque ports (q.v.), and guardian of the adjacent coast; an office comprising extensive jurisdiction, civil, naval, and military, the greater part of which was taken away by 18 and 19 Viet. c. 48.—As to the lord warden of the Stannaries, see STANNARIES.

WARDHOLDING, the military tenure of land in Scotland under the feudal system, by which the vassal was bound to serve the superior in war whenever called on to do so. As the military duties of the vassal could not be performed when he was under age, the

superior had a right both to the guardianship of his person and to the possession of his fee during his minority. An arrangement, however, was frequently made by which this right was commuted into an annual payment, in which case the fee was said to be held in *taxed ward*. When an unmarried vassal succeeded, the superior was entitled to a sum proportionate to the value of the estate, called the *avail of marriage*; and a larger sum, called the *double avail of marriage*, was due when the superior named a wife for his vassal, and the vassal, rejecting her, married another woman. If a vassal alienated his lands or the larger portion of them without consent of his superior, the fee fell to the superior by what was called the casualty of *recognition*, which was a check on vassals impoverishing themselves to such an extent as would render them unfit to perform feudal services. Wardholding was abolished by 20 Geo. II. c. 50, as a system hazardous to the public tranquillity such fees as were held ward of the crown being converted into *blanch* (q.v.) holdings, and those held of subjects becoming feu-holdings, a yearly sum being made payable to the superior, as a recompense for the casualties which were done away with.

WARDIAN CASES, close glass cases placed upon a trough containing soil, and accurately fitted to it, intended for the growth of plants in the windows of apartments. Remarkable success has attended the use of them even in the smoky atmosphere of the largest towns. Ferns and other plants may now be seen in great beauty and luxuriance in these cases in the windows of houses in London and in all the cities of Britain. They are especially adapted to those plants which require an atmosphere more moist than that of an inhabited apartment can ordinarily be. They derive their name from the inventor, Mr. W. B. Ward, of London. To the success attending them the invention and frequent use of *vivaria* for marine animals is with great probability attributed.

WARDLAW, RALPH, D.D., the most celebrated preacher and theologian in the roll of Scotch Independents, was a seceder by extraction, and studied in connection with the Associate Secession church. Before he had completed his curriculum, however, he had convinced himself that congregational independency was the scriptural system of church government. In 1800 he began to preach, and after some time settled in Glasgow as pastor of an Independent church. In 1811 he was appointed professor of theology to the Congregational body in Scotland, in conjunction with the rev. Greville Ewing; an office he retained, along with his pastorate, to the period of his death, which happened on Dec. 17, 1853. Wardlaw's life was a very laborious and earnest one. Besides discharging faithfully and ably the duties of the pulpit and the professor's chair, he was a voluminous author, often involved in theological controversy, and a prominent actor in the public religious and philanthropical movements of the day. His intellect was acute, his understanding sound, and his style remarkable for its perspicacity, vigor, and grace. The most important of Wardlaw's works are: *Discourses on the Socinian Controversy* (1813); *Lectures on Ecclesiastes* (2 vols. 1821); *Essays on Assurance of Faith, and on the Extent of the Atonement and Universal Pardon* (1830); *Discourses on the Sabbath* (1832); *Christian Ethics* (1833); *Discourses on the Nature and Extent of the Atonement of Christ* (1843); *The Life of Joseph and the Last Years of Jacob* (1845); *Congregational Independency* (1848); *On Miracles* (1852).—See *Life and Correspondence of Ralph Wardlaw*, by Dr. Alexander (1856).

WARDÖEHUUS, a sea-port in Norway, at the e. extremity of Finmark, stands on the island Wardöe or Vardöe, and is protected by a fort, the most northerly fortification on the globe, being in lat. 70° 22'. The inhabitants, inclusive of the garrison of 24 men, number only 120. Not even potatoes or barley comes to maturity; and the few cows that are kept have sometimes to be fed on herrings.

WARDSHIP, in English feudal law, was the guardianship which the feudal lord had of the land of his vassal while the latter was an infant or minor. Until the majority of the infant, the lord, out of the profits, provided a fit person to render the services incumbent on the vassal. See **TENURE**, **WARDHOLDING**.

WARE, a co. in s. Georgia, containing Okefinokee swamp in the s. portion; 850 sq.m.; pop. '80, 4,159—4,135 of American birth, 1,143 colored. Co. seat, Way Cross.

WARE, a small market-t. in Herts, 2½ m. n.e. of Hertford. Malting, for which there are several establishments, most of them engaged in supplying the London breweries, is the principal employment. There is a silk-mill here, employing 200 hands, and two large paper-mills. In one of the inns of the town is still to be seen the famous bed of Ware, for a notice of which, see **BED**. Pop. '71, 4,917.

WARE, HENRY, D.D., 1764–1845; b. Mass.; graduated at Harvard in 1785. He was pastor of the First church in Hingham, Mass., 1787–1805, when he was called to the Hollis professorship of divinity at Harvard college, where he remained till his death. During his residence at Cambridge the Congregational churches were divided into the groups known as Unitarian and Evangelical. Dr. Ware, with Drs. Norton and Channing, was one of the leaders of the former. He carried on a controversy with Dr. Woods, whom he answered in *Letters addressed to Trinitarians and Calvinists* (1820). He also published *Evidences, etc., of Christianity* (1842).

WARE, HENRY, D.D., 1794-1843; b. Mass.; son of Henry. He was graduated at Harvard in 1812; was for a time an instructor in Phillips Exeter academy, and in 1817 was settled over the Second church (Unitarian) in Boston. He was professor of pulpit eloquence and pastoral care in the Harvard divinity school, 1829-42. He was one of the editors of the *Christian Disciple*, afterward the *Christian Examiner*, a Unitarian newspaper. Among his works are *Hints on Extemporaneous Preaching* (1824); and *Life of the Saviour* (1832).

WARE, WILLIAM, 1797-1852; b. Mass.; son of the elder Henry. He was educated at Harvard college and the Harvard divinity school; was settled over Unitarian churches in Brooklyn, Conn., Burlington, Vt., New York, and Waltham, Mass., and retired from the ministry on account of ill-health. His historical novels, *Zenobia*, originally published in the *Knickerbocker Magazine* for 1837, as *Letters from Palmyra*; *Aurelian* (1838); and *Julian* (1841), had considerable reputation. He was for some years editor of the *Christian Examiner*.

WAREHAM, an exceedingly ancient though small t. of Dorsetshire, stands between the rivers Piddle and Frome, 14 m. nearly due e. from Dorchester. It was a British town, and afterward a Roman station, and is surrounded by a British vallum or rampart of earth, which, although extremely ancient, is still about 30 ft. high, and is perfect on three sides. The chief trade is the export of potter's clay; there are also breweries, malt-houses, and brick-fields. The borough, comprising the parishes of Holy Trinity, Lady Saint Mary, Saint Martin Arne, Bere Regis, Corfe Castle, and parts of the parishes of East Stoke and Morden, sends a member to parliament. Pop. '71, 6,532.

WAREHOUSEMAN, in law, any person receiving goods and merchandise for storage only. As a bailee he is held only to use ordinary care, as the contract is one of mutual benefit. But he may assume full responsibility by special agreement. The same party may be a warehouseman in certain relations and a common carrier in others. Thus, if a railroad makes a contract to store certain merchandise until a fixed day and then to transport it, it becomes a common carrier (and practically, an insurer) upon that day, whether the goods are then moved or not. The warehouseman's lien is for storage of the particular goods only and not for a balance of accounts. It has been held that his liability begins when the crane is attached to goods which are yet outside the storehouse.

WAREHOUSING SYSTEM is a plan for lessening the pressure of excise or customs duties by postponing payment of them until the goods they are laid on pass to the consumer, or, at all events, to the retail dealer. A merchant who might import a thousand pounds' worth of wine or tobacco, if he only paid duty on it by installments as it went out to the dealer, would be quite unable to import so much if he had to pay somewhere from one to five thousand pounds of duty on its arrival. The system of bonded warehouses was hence adopted. The taxable commodity thus came to be locked up in a government warehouse, and the duty to be paid on its removal, along with a proportional fee or rent for the custody of the article, or its accommodation in government premises. Bonding in this manner was part of the scheme of sir Robert Walpole, in 1733, generally known as the excise scheme, which was defeated from its unpopularity. The system was first authorized by an act of George III. in 1802. When the customs laws were from time to time consolidated, the warehousing act formed a portion of the consolidation. In the consolidation of 1846 there was a separate "act for the warehousing of goods." In the latest consolidation of 1853 the warehousing system is embodied in clauses 41 to 113 inclusive of the general "customs consolidation act" (16 and 17 Vict. c. 107). This process, by which the crown holds in custody the goods of private persons, has produced some curious effects on mercantile law and trading practices. When transactions have taken place about bonded goods, should they be injured or destroyed, it may come to be a question of nice adjustment who is to bear the loss, seeing there is not possession to show ownership; and still nicer questions sometimes arise as to whether such goods are or are not part of a bankrupt estate. There is a difficulty in securing money upon goods without transferring their absolute possession, as in the case of pledging or pawning. The warehousing system, however, by retaining the goods for the owner, whoever he may be, has created a complete system of paper money in the transference of the title-deeds, as they may be called, of such goods—the dock-warrants or other documents—the possession of which is equivalent to possession of the goods.

WARFIELD, CATHARINE ANNE (WARE), 1817-77; b. Washington, Miss.; daughter of Nath. A. Ware, secretary Mississippi territory (an author and writer on political economy), granddaughter of capt. Charles Percy, of the British navy; educated at Philadelphia; married Elisha Warfield of Lexington, Ky., in 1833, and removed to a farm near Louisville. With her sister, Mrs. Eleanor Lee (d. 1850), she published *The Wife of Leon*, and other Poems (1843), under the nom de plume of "Two Sisters of the West." She was sole author of *The Household of Bouverie* (1860, new ed. 1875); other romances following annually; among them *Hester Howard's Temptation* (1875).

WARHAM, JOHN, 1590-1670; b. England; was a distinguished Puritan minister at Exeter; came to Massachusetts in 1830; was with the Plymouth church, and was co-

pastor with John Maverick; was settled at Dorchester; the church removed to Windsor, Conn., and the following year Mr. Warham followed and joined them.

WARING, GEORGE E., b. Conn., 1833; for a time agricultural engineer of Central park, New York. He was col. of the 4th Missouri cavalry during the war of the rebellion. Among his works are: *Whip and Spur*; *A Farmer's Vacation*; *The Bride of the Rhine*; and *Tyrol and the Spirit of the Alps*. He is a sanitary engineer of some reputation, and has published *Sanitary Drainage of Houses and Towns*.

WARM-BLOODED ANIMALS. Under this title are included those vertebrates which possess a four-chambered heart and spongy lungs; the heart and lungs being so arranged that the whole of the venous or impure blood is propelled over the large but closely-packed capillary area of the lungs, by successive contractions of a special ventricle, receiving it from a distinct auricle (these being called the right or pulmonary ventricle and auricle), while the blood thus purified by the action of the air in the lungs is conveyed to another auricle, and propelled over the whole system by a second distinct ventricle (these being known as the left or somatic auricle and ventricle). The only animals which exhibit these structural peculiarities are mammals and birds. In man and in the ox the mean temperature of the interior of the body is 100°; in the mouse it is 99°; while in the whale it is 103°. In birds it ranges, in different species, from 106° to 112°. The warm-blooded animals present, however, gradations of their heat-making power. In the hibernating animals there is commonly a loss of heat of from 10° to 20° during their winter-sleep; and in the bat the temperature falls to 40°. In the cold-blooded animals, the fishes, amphibians, and reptiles, the temperature of the blood rarely exceeds that of the surrounding medium. For the general characters of the warm-blooded animals, the reader is referred to the articles BIRDS and MAMMALIA.

WARMING AND VENTILATION. **WARMING.**—A certain temperature, constant within narrow limits, is essential for the life of warm-blooded animals, and the heat by which this temperature is maintained is produced by the vital actions of the body itself. See ANIMAL HEAT, TEMPERATURE OF THE BODY. In the case of man, however, at least in ordinary climates, and in the civilized condition, the heat of the body, if allowed freely to escape, would be dissipated faster than it is produced; and hence arises the necessity of clothing, houses, and other means of retarding its escape. To allow the body to continue depressed in temperature beyond the natural state, instead of hardening, infallibly weakens its vitality, and sows the seeds of disease; and that this error is committed on a vast scale, in Britain more especially, is apparent enough. The reports of the registrar-general show that exactly as the thermometer sinks, the rate of mortality rises and certain diseases of the most fatal kind become more prevalent; the vitality, in short, of the community decreases as the warmth of the atmosphere decreases. Could this be if the means taken to arrest the waste of heat from our bodies, or to supplement it, were not, for the majority of men and women, insufficient, or injudiciously managed? This is a matter of literally "vital" moment to one and all. The economy of heat is a primary element in the art of living in health and comfort; and "no knowledge of common things" that we can think of can surpass in importance a right understanding of the principles and facts on which that art rests.

Where fuel is scarce the resource against the cold of winter is thick clothing indoors as well as out. This is said to be the regular practice in China; and even in the south of Europe fires are dispensed with in weather when we should think them absolutely necessary, and additional wrappings are considered as appropriate while sitting in the house as in the open air. But wherever fuel can be had, it is always preferred to wear within doors much the same clothing in winter as in summer, and to keep the apartments nearly at summer temperature by artificial heat. It is this special branch of the subject, viz., the artificial warming of apartments, that we are at present to consider; and in doing so, we presume the reader to be acquainted with the more general facts regarding the generation of heat by combustion, and its diffusion, as stated in the articles COMBUSTION, FLAME, FUEL, HEAT.

The great aim, it may be premised, in all plans of warming is, as it is expressed by Dr. Arnott, "*to obtain everywhere on earth at will, the temperature most congenial to the human constitution, and air as pure as blows on a hill-top.*" The obtaining of the desired temperature would be comparatively easy by itself; the difficulty lies in combining warmth with pure air. Warming and ventilation are thus in some degree antagonistic operations, and are therefore best treated in one article. The various plans of warming hitherto tried may be classed under the four heads of the open fire, stoves, gas, steam and hot-water.

The Open Fire.—The first application of artificial warmth consisted, most likely, in lighting a fire of dried sticks and leaves in a grove, a cave, or other natural shelter. When tents or wigwags came to be erected, the fire would be lighted on the middle of the floor, with perhaps a hole in the roof for the smoke to escape by. This primitive arrangement may still be seen in some of the cabins of Ireland and the Scottish highlands. The Romans warmed their apartments chiefly by portable stoves or chafing-dishes, without any regular exit for the smoke and fumes; and a brasier of charcoal is still the chief means of heating sitting-rooms in Spain and Italy, which are in general without chimneys. The chimney (q.v.) is a modern invention.

The open coal-fire glowing in a grate, which is the prevalent mode of warming dwelling-houses in Britain, has an air of cheerfulness and comfort, and a power of concentrating the whole family in one social circle, that make it almost an object of worship; but it is not without serious drawbacks, the most serious of which is the waste of fuel it occasions. About one-half of the heat produced by a common fire ascends with the smoke—the black part of the smoke itself being an unconsumed part of the fuel—while about a fourth of the heat which is radiated into the apartment is, in ordinary circumstances, carried into the chimney between the fire and the mantel-piece, and thus lost. It was calculated by Dr. Arnott that only about one-eighth part of the heat-producing power of the fuel used in common fires is realized, all the rest being dissipated into the surrounding atmosphere. A common fire gives also a partial kind of warmth, heating the side of the body next to it, but leaving the rest cold; and it produces draughts into our rooms which are anything but safe or agreeable. Notwithstanding these and other acknowledged evils, the open fire continues to hold its place, partly perhaps from prejudice, partly from real points of superiority over other methods as yet practiced; and the object of late has been not so much to do it away, as to improve it.

Grates.—One improvement consists in diminishing the quantity of metal in immediate contact with the fuel, and forming the back and sides of the grate of fire-bricks. The bricks act like clothing, and keep in the heat of the coals, thus rendering the combustion more complete, and the fire far hotter; while iron, being a good conductor, runs away with the heat as fast as it is generated, and passes it into the wall, making the coals that touch it dull and black. The same quantity of fuel, therefore, burned in a brick-lined grate, not only produces more heat, but throws a greater proportion of that heat out into the room, and less up the flue and through the wall, than when it is surrounded by a mass of iron; for radiation depends more upon the intensity of heat than upon its quantity.

Another point deserving attention is the shape given to the chimney-mouth, or recess above the grate. When the sides are square with the back none of the heat falling on them is given out again into the room. With a view, therefore, to throw out the heat better, the sides, or *corins*, as they are called, are inclined to the back at an angle of about 130° ; and sometimes they are made curved and of polished metal, in order that they may reflect the heat without absorbing it. It is questionable if simple brick slabs, placed at the proper angle, do not throw out more heat than the most splendid polished metal plates; for though the bricks do not reflect the rays of the fire, they become heated themselves, and then radiate their heat into the room. Plates of rough metal absorb the heat that falls upon them as the brick does; but being good conductors, the heat passes through them into the wall, and thus they never become hot enough to radiate sensibly.

Much also depends upon the shape of the fire-box, or grate itself. To see the importance of this, it is necessary to attend carefully to the exact way in which an open fire heats a room. It does so almost entirely by the rays of heat that it throws out; and these rays do not warm the air directly; they pass through it like light through glass, just as the hottest rays of the sun pass through the upper atmosphere, leaving it cold enough to freeze mercury. It is only when the rays of the fire fall on the floor, furniture, and walls of the room that they gave out their heat; and it is by coming in contact with these solid heated bodies that the air is gradually warmed. We may thus see the necessity of having a fire lighted and burning brightly for a considerable time before the hour when the apartment is expected to be comfortable.

The law that radiant heat neither affects nor is affected by the surrounding air, also explains the fact that an apartment may feel very cold, though the air in it be at high summer heat. A church or other massive stone building in frosty weather may be filled with artificially-heated air and yet retain its chilling effect for many hours. The warmth of the living body is lost in two ways: the film of colder air that touches it receives part of its heat by conduction, and, rising up, makes room for another film to do the same; a moderately heated body in cooling is robbed of about half its heat in this way. The other half is given off in rays, which pass through the air, and impinge upon the objects around. These objects are radiating back heat in return; but their temperature being low, the return is small, and the warmer body is colder by the difference. Hence we are chilled by a cold wall or a cold window without touching it, and though the air between us and it may be at 70° .—To return to the shape of the grate:

The chief object is to present as large a surface as possible of glowing fire to the front. With this view, the grate is made long and deep, in proportion to its width from front to back. This principle, however, is carried too far in many grates. The stratum of fuel is too thin to burn perfectly, especially in the narrow angles at the sides, where the coals seldom get to a red heat, and are only warm enough to distil away in smoke. Such fires are constantly going out, and are further from being economical than a square box.

The practice recently come into vogue of placing grates almost on a level with the floor, is also a mistake. The floor and the lower part of the person receive no share of the radiant heat.

The chimney-throat, instead of a gulf drawing in a constant wide current of the warm air of the room, and causing draughts from windows and doors toward the fireplace, should just be sufficient to admit the burned gases and smoke that come directly

from the fire, and no more. See CHIMNEY. This is the object of the movable plate in what are called *register-grates*.

It would be endless to attempt to enumerate the various forms of grate constructed with more or less success on the above principles. We shall content ourselves with a notice of the recent invention of the late Dr. Arnott, to whom the subject of warming apartments is more indebted than to any individual since the days of count Rumford. It comes nearer to the idea of perfection in an open fire-place than any previous contrivance. Its peculiar advantages will be understood from the following description:

Arnott's Smokeless Grate.—*ab*, *cf* (fig. 1), represent the front bars of a grate in a chimney of the usual construction, *rsu*.

The grate has no bottom, and below it is an iron box, open only at top, into which the charge of coal for the day—from 20 to 30 lbs.—is put. Any kind of coke or coal may be used. To light the fire the usual quantity of wood is laid on the surface of the fresh coal at *cf*, and a thickness of 3 or 4 in. of cinders or coked coal, left from the fire of the preceding day, is laid over all. "The wood being then lighted, very rapidly ignites the cinder above, and at the same time the pitchy vapor from the fresh coal below rises through the wood-flame and cinders, and becomes heated sufficiently itself to become flame and so to augment the blaze. When the cinder is once fairly ignited, all the bitumen rising through it afterward burns, and the fire remains smokeless."

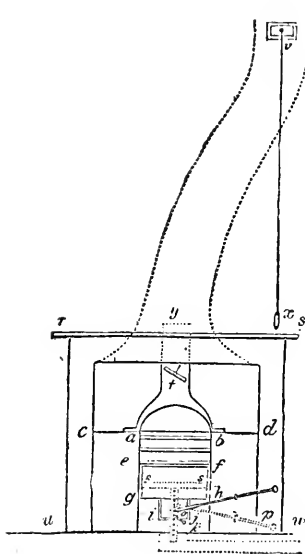


FIG. 1.

As there is no supply of air but through the bars in front, the box being close underneath, the fire must be gradually raised up as the combustion goes on; and this is effected by having a false bottom, *ss*, in the box, which can be moved like a piston by means of a rod. The rod has notches in it, and by means of the poker used as a lever can be raised up and then retained at any height by a ratchet-catch. When the piston comes level with the bottom bar of the grate, the coals may be replenished while the fire is burning by pushing in a flat shovel over the piston, so as to form a temporary bottom to the grate and support the fire, while the piston is allowed to descend to the bottom. The shovel is then raised up a little in front, or a part of the upper edge of the box is made of

fold down, and fresh coals are shot into the box; on which the shovel is withdrawn and the combustion goes on as before.

"A remarkable and very valuable quality of this fire is its tenacity of life, so to speak, or its little tendency to be extinguished." Even after it sinks below the level of the box it does not go out, but continues to smolder slowly for a whole day or night, and is ready to burn up actively when the piston is raised.

Another peculiarity of the Arnott grate is the means taken to diminish the proportion of the heat usually carried up the chimney. Of the thick column of smoke that issues from a common chimney-can, only a small fraction is true smoke or burned air; the rest consists of the warmest air of the room, which becomes mixed with the true smoke in the large space usually left between the top of the fire and the throat of the chimney. "The whole of the air so contaminated, and which may be in volume twenty, fifty, or even a hundred times greater than that of the true smoke or burned air, is then all called smoke, and must all be allowed to ascend away from the room that none of the true smoke may remain. It is evident, then, that if a cover or hood of metal be placed over a fire, as represented by the letters *yab* in the diagram—or if, which is better, the space over the fire be equally contracted by brickwork, so as to prevent the diffusion of the true smoke or the entrance of pure air from around to mix with it, except just what is necessary to burn the inflammable gases which rise with the true smoke—there will be a great economy. This is done in the new fire-place with a saving of from one-third to one-half of the fuel required to maintain a desired temperature. In a room, the three dimensions of which are 15 ft., 13½ ft., and 12 ft., with two large windows, the coal burned to maintain a temperature of 65° in cold winter days has been 18 lbs. for 19 hours, or less than a pound per hour."—*Arnott's Warming and Ventilation*.

The hood is furnished with a throttle-valve or damper, *t*, having an external index showing its position, so as to give complete control over the current. The provision made for ventilation in this fire-place is considered further on.

Even in this, perhaps the most economical form of open fire yet contrived, there is still great waste of the heat actually produced by the combustion. To say nothing of what passes by conduction from the fire itself into the wall and is mostly lost, the quantity carried off in combination with the hot gases, though no more air is allowed to enter

than is necessary for complete combustion, is still great. It deserves being noticed that the proportion thus carried off is greatest in the case of fuel that burns with flame. Experiment shows that a fire of wood radiates one-quarter of its heat, the rest flying up; while the radiation from wood-charcoal is one-half of the whole heat produced. Every one has felt that a *blazing* fire has far less warming effect than a glowing one. Not that flame has not intense heat in it—more intense even than a glowing fire, but it gives it out only by contact and not by radiation. It thus appears that any mode of heating that depends upon direct radiation, as the open fireplace chiefly does, necessarily involves great waste of fuel. This can be avoided only by applying the heat on a different principle, which consists in first making the fire heat certain apparatus with considerable surface, which then by radiation and contact with the air of the apartment diffuses its heat throughout it. This is the principle of the other methods of warming, which we now proceed to describe. The consideration of methods that combine the two principles will come most conveniently last.

Warming by Stoves.—A close stove is simply an inclosure of metal, brick, or earthenware, which is heated by burning a fire within it, and then gives out its heat to the air by contact, and to surrounding objects by radiation. The simplest, and, so far as mere temperature is concerned, the most effective and economical of all warming arrangements, is what is called the Dutch stove; which is simply a hollow cylinder or other form of iron standing on the floor, close at top, and having bars near the bottom on which the fire rests. The door by which the coals are put in being kept shut, the air for combustion enters below the grate, and a pipe issuing from near the top carries the smoke into a flue in the wall. If this pipe is made long enough by giving it, if necessary, one or more bends, the heated gases from the fire may be made to give out nearly all their heat into the metal before they enter the wall; and thus the whole heat of the combustion remains in the room.

The great objection to this form of stove is that the metal is apt to become overheated, which not only gives rise to accidents, but has a hurtful effect upon the air. The exact nature of the change that highly heated metal produces upon air is not very well understood. It cannot be said to burn it, in the proper sense of the word, for none of its oxygen is abstracted, but it gives it a peculiar odor, which is both unpleasant and unwholesome. This is thought to arise in some measure at least from the hot iron burning the particles of dust that light on it, which particles consist of organic matter, such as wool, wood, etc.

Part at least of the unwholesomeness of air so heated arises from its excessive dryness; it parches and withers everything it touches, like the African simoom. It must not, however, be supposed that this is peculiar to air heated by contact with metal; *air suddenly heated is always unwholesomely dry*. This is an important point in regard to the subject of warming, and requires consideration. A cubic foot of air, say at 32°, can contain a certain quantity of moisture and no more; but if heated to 80°, it is capable of containing *five* times as much, and has thus become *thirsty*, and drinks up moisture from everything that contains any. The heating of air, therefore, does not dry it, in the sense of taking moisture from it, it only renders it greedier of more; and this is equally true whether it is heated by a stove or an open fire. The chief difference is that in the latter case the warming is more gradual, and no part of the air becomes very highly heated; while the air that touches a metal plate near redness is all at once rendered intensely thirsty, and, before its fierceness is tempered by thoroughly mixing with the rest of the atmosphere of the room, must be highly pernicious. But whenever the temperature within doors is much higher than without, the air is in a too thirsty state, and parches the skin and lungs, unless means be taken to supply the necessary moisture. *An evaporating pan or other contrivance is an essential part of warming apparatus; it is specially necessary to attend to this during e. winds, which are generally too dry even at their natural temperature.*

All improvements on this simple and rude form of stove aim at avoiding a high heat in the warming surface, and this chiefly by lining the fire-box with brick, and inclosing it in several casings, so as to enlarge the heated surface. In the kind of stove called a *cock's*, the fire is burned in a small furnace within the inner case, and the air is warmed by circulating between the inner and outer cases. When placed in the apartment or hall to be warmed, the outer casing has perforations about the top for the issue of the warm air. For heating churches and similar buildings, the stove is placed in a separate furnace-room, and the warm air is conveyed to the different parts of the building in pipes or flues, while fresh air is drawn to the stove through a channel or culvert leading from outside the building to the openings in the outer casing.

The stove invented by Dr. Arnott is upon the same principle of an extensive and moderately warm heating surface. Under a sense of professional honor, Dr. Arnott did not take out a patent for his stove; it was therefore made by many furnishing ironmongers in the metropolis and elsewhere, some of whom took out patents for what they considered as improvements upon it. No fewer than 12 patents were taken out in one year for modifications of this stove, *all of which Dr. Arnott considered to be upon false principles*. The consequence has been that many Arnott stoves, which had been introduced into houses, have been given up on account of the inconvenience felt from the species of heat which they generated. It is also, however, to be observed that the stove,

made even upon the most approved principles, requires certain adjuncts and conditions in order to operate healthfully and agreeably.

The accompanying figure represents the Arnott stove in the most improved form given to it by the inventor. We give the description in his own words: "The complete self-regulating stove may indeed be considered as a close stove, with an external case, and certain additions and modifications now to be described. The dotted lines and small letters mark the internal stove, and the entire lines, the external case or covering. The letters ABCD mark the external case, which prevents the intense heat of the inner stove, *abcd*, from damaging the air of the room. F is the regulating-valve, for admitting the air to feed the fire. It may be placed near the ash-pit door, or wherever more convenient. The letters *ff* mark the fire-brick lining of the fire-box or grate, which prevents such cooling of the ignited mass as might interfere with the steady combustion. H is a hopper, or receptacle with open mouth below, suspended above the fire like a bell, to hold a sufficient charge of coal for 24 hours or more, which coal always falls down of itself, as that below it in the fire-box is consumed. The hopper may at any time be refilled

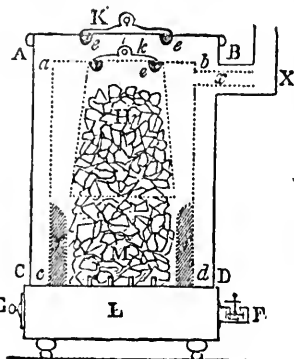


FIG. 2.

with coal from above, through the lid, *k*, of the hopper, and the other lid, *K*, of the outer case. These lids are rendered nearly air-tight by sand-joints; that is, by their outer edges or circumference being turned down, and made to dip into grooves filled with sand, as at *e, e*. The burned air or smoke from the fire, *M*, rises up in the space between the hopper and the inner stove-case, to pass away by the internal flue, *x*, into the other flue, *X*, of the outer case. *L* is the ash-pit under the fire bars. *G* is the ash-pit door, which must be carefully fitted to shut in an air-tight manner, by grinding its face or otherwise. *M* is the coal intensely ignited below where the fresh air maintains combustion, but colder gradually as it is further up. Only the coal in the fire-grate below, where the fresh air has access to it through the fire-bars, can be in a state of active combustion." The self-regulating valve above mentioned is an ingenious contrivance by which the passage for the air is rendered narrower according to the force of the draught. Dr. Arnott describes various other plans of effecting the self-regulation of the combustion.

A drawer inserted into the heated chamber of the stove would serve for cooking meat, and a pot for boiling might be placed upon the fire box; it is, therefore, as the inventor remarks, peculiarly the *poor man's* stove. Or, by making the space between the two casings water-tight, a *water-stove* is produced, which, besides securing a regulated heat, offers many other conveniences.

In Russia, many parts of Germany, and other northern countries of Europe, the stoves are usually built of brick, covered with porcelain. They are of the size of a large and very high chest of drawers, and usually stand in a corner of the room. The fire is burned in a furnace near the bottom, and the heated smoke is made repeatedly to traverse the structure from side to side, along a winding passage, before it reaches the top, where a pipe conveys it, now comparatively cold, into a flue in the wall. The heated mass of brick continues to warm the room long after the fuel is burned. It is generally sufficient to warm the stove once a day. The same quantity of wood burned in an open grate would be consumed in an hour, and would hardly be felt.

Open-fire Stoves.—As a specimen of the numerous plans for combining the advantages of the stove and the open fire, we may take Sylvester's stove or grate, which is thus described in Ronalds and Richardson's *Technology*: "The fuel is placed upon a grate, the bars of which are even with the floor of the room. The sides and top of these stoves are constructed of double casings of iron, and in the sides a series of vertical plates, parallel with the front facing, are included in the interior, which collect, by conduction, a great portion of the heat generated from the fire—the mass of metal of which these are composed being so proportioned to the fuel consumed that the whole can never rise above the temperature of 212° Fahr. under any circumstances. The sides and top of the stove are thus converted into a hot chamber, offering an extensive surface of heated metal; at the bottom, by an opening in the ornamental part, the air is allowed to enter, and rises as it becomes warmed, traversing in its ascent the different compartments formed by the hot parallel plates, and is allowed to escape at the top by some similar opening into the room." The Sylvester stove can either be placed in an ordinary chimney recess or be made to stand ornamentally forward into the room. The feeding-draught may be either taken directly from the apartment or brought by flues from the outside of the building.

The idea of having an air-chamber behind and around the fire-place, from which warm air would issue into the room, thus saving part at least of the vast amount of heat that is lost by passing through the wall, is not new, having been put in practice by the

cardinal Polignac in the beginning of last century. But the way to carry the principle out to the full would be to have the open fire-place in a pier of masonry standing isolated from the wall, like a German porcelain stove. A very small fire would keep the whole mass mildly heated. The pier could receive any shape, so as to give it architectural effect; and it might either terminate in the room—the smoke, after parting with most of its heat, being conducted by a pipe into the wall—or it might be continued into the story above, where its heat would still be sufficient to warm a bedroom. An Arnott smokeless grate, set in the pedestal of an ornamental column, which might either stand in front of the wall or in a niche in its depth, might be made the *beau-ideal* of comfort, economy, and elegance.

Warming by Gas.—A prejudice arose against gas as a medium of heat, from the first attempts to employ it being made in an unskillful way. But when care is taken to carry off the products of combustion by a pipe, and to prevent overheating, gas stoves will be found economical and pleasant, and capable of being used in situations where a common stove is inadmissible.

In stoves gas should always be burned with the Bunsen burner, which is generally employed by chemists when they make use of gas for heating purposes. It consists of a small brass cylinder, or chimney, set over the gas jet, like the glass of an argand lamp, with openings near the bottom to allow air to enter. The gas being admitted into this before lighting, mixes with the air, and when lighted at the top, which is usually covered with wire-gauze or perforated metal, burns with a pale blue flame. The most complete combustion and the greatest heat are obtained in this way. Smoke, properly so called, there is none. Still, it must not be forgot that there is burned air—a cubic foot of carbonic acid, besides a quantity of watery vapor, for every cubic foot of gas used; and, therefore, even with the Bunsen burner, these gaseous products should, wherever it is possible, be conducted away.

A pleasant and very serviceable gas-stove might be constructed by making the casing double, to contain water. It has been ascertained that a gallon of water may be brought to the boiling point in 20 minutes by burning 4 cubic ft. of gas, which, at 4s. 6d. per 1000 ft., costs less than a farthing. The cost of doing the same by a newly-lighted coal-fire is more than threefold.

Steam and Hot Water.—The immediate warming agent in these two methods is the same as in Arnott's and other low-temperature stoves—viz., an extensive metallic surface moderately heated; but instead of heating these surfaces by direct contact with the fire, the heat is first communicated to water or steam, and thence to the metal of a system of pipes. This affords great facility in distributing the heat at will over all parts of a building; and these methods are peculiarly adapted to factories, workshops, and other large establishments. Other advantages are—freedom from dust, and from all risk of overheating and ignition.

Steam.—Steam-warming is generally adopted in establishments where steam-power is used, as the same boiler and furnace serve both purposes. When steam enters a cold vessel it is condensed into water, and at the same time gives out its latent heat till the vessel is raised to 212°, when the condensation ceases. The condensing vessel is usually a cast-iron pipe placed round the wall of the apartment near the floor. In admitting fresh air into the room it may be made to pass over this pipe, and thus be warmed. The steam is conducted from the boiler by a smaller tube, which may be covered with list or other material, to prevent all condensation by the way; and the admission of the steam is regulated by a cock within the apartment, means being provided for allowing the air to escape. Where a pipe cannot be laid round the room, a coil of pipe may be formed, or the steam may be admitted into a large vessel or into a hollow statue, forming a steam stove. Allowance must be made for the expansion of the tubes by heat; and they are so arranged that the condensed water is conveyed back to the boiler.

There can be no proper comparison between this plan of heating and that of common fire-places. Coal-fires cannot warm the air in large workshops; the heat is confined to their own immediate neighborhood; hence the workmen are often obliged to draw near the grate to warm themselves. According to the plan here adopted every part of the house is equally heated, and the whole of the workmen are as comfortable during the hardest frosts as if they were working in a pleasant summer day. It is difficult to estimate the expense of supplying the heat, seeing that the steam happens to be drawn from a boiler which is always in operation for other purposes. Excellent, however, as the process is, it is for many reasons unsuited to private dwelling-houses.

In calculating how much surface of steam-pipe will be sufficient to warm a room, it is customary to allow about 1 foot square for every 6 ft. of single glass window, of usual thickness; as much for every 120 ft. of wall, roof, and ceiling, of ordinary material and thickness; and as much for every 6 cubic ft. of hot air escaping per minute as ventilation, and replaced by cold air.

Hot Water.—Hot-water apparatus was applied as early as 1777 by M. Bonnemain, in Paris, to warm the hot-houses at the Jardin des Plantes, as well as for the artificial hatching of chickens. It was first introduced into England by the Marquis de Chabannes in 1816, and is now used in many large buildings. It is more economical than steam, except where a steam-boiler is required for machinery; and from this and other

advantages it is generally preferred to steam-apparatus. One of these advantages is that the heat begins to be distributed, in some degree, as soon as the fire is lighted, while with steam-apparatus the whole of the water must be at boiling-heat before any steam enters the pipes.

There are two kinds of hot-water apparatus—high-pressure and low pressure. In the first the water is confined, and can be heated to any degree; in the other it is open to the air, and cannot be heated above 212° . Fig. 3 will explain the way in which water is made to carry the heat of a furnace to any part of a building by the low-pressure method. *a* is a boiler, from the top of which a tube issues, and after circulating through the building, re-enters near the bottom. At the top of the circuit there is a funnel, or a small cistern, *c*, by which the tubes and boiler may be kept full. When the fire is lighted at the bottom of the boiler, the heated portion of water, being lighter than the rest, rises toward the top through the tube *bb*, while the colder water from *dd* flows in to take its place. The tube is made to traverse the apartments to be warmed, where it gives out its heat to the air; the returning portion of the pipe is thus always colder and therefore heavier than the other, so that the circulation is constantly kept up. The warming surface is increased, wherever it is necessary, by coiling the pipe, or by making expansions upon it of various forms, so as to constitute water-stoves.

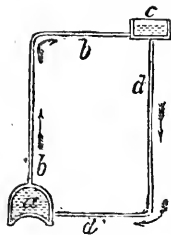


FIG. 3.

sary, by coiling the pipe, or by making expansions upon it of various forms, so as to constitute water-stoves.

To avoid the necessity of so large a surface, and such a mass of water as is required at the low-temperature the water attains in the pipes of this kind of apparatus, Mr. Perkins introduced the high-pressure system. In this the pipe is made comparatively small, but very strong, and is formed into an endless circuit cut off from the atmosphere. The water is heated by making a number of coils of the pipe itself pass through the furnace; and as the whole circuit forms a shut vessel, as it were, the temperature may be raised to 300° and upward, according to the strength of the pipes. This high temperature causes a rapid circulation. In filling the tube with water care is taken to expel all the air; and at the top of the system there is an expansion of the tube, equal to 15 or 20 per cent of the capacity of the whole, which is left empty both of water and air, to allow for the expansion of the water when heated. The arrangement of the pipe may be various; the plan generally followed is to place a considerable coil of it within a pedestal or bunker, with open trellis-work in front, in a convenient part of the room. It may also be made to wind round the room, behind the skirting-board, which, being perforated with holes, will allow of the entrance of the warmed air.

The hot-water apparatus has been fitted up by Messrs Perkins & Heath in various public buildings, warehouses, and gentlemen's houses; and, while sufficiently effective for the desired end, it has been proved to be attended with as few drawbacks as any regulated mode of heating whatever. But there is a great obstacle to its general adoption in its expensiveness. The temperature also becomes at times so high as to cause a disagreeable odor. Another objection is its liability to burst; though, from the tubes being of malleable iron, such an accident causes more inconvenience than serious danger.

Conservation of Warmth.—The art of warming embraces not only the production and distribution of heat, but the construction of apartments with a view to prevent its escape. The way to effect this—setting aside in the meantime the necessity of renewing the air—is, in the first place, to make the walls, floor, windows, doors, etc., as impervious to air as possible, to prevent the heat from being carried off by currents; and in the next place, to make them bad conductors of heat. For this last purpose, the walls ought to be sufficiently thick, and, if possible, built of non-conducting materials. Solid iron would make a cold wall; wood, a warm one; and in this respect brick or porous stone is preferable to hard stone. But the chief element in a warm wall is that it be *double*, which every wall in effect is when it is lined by a coating of plaster, kept apart from the wall itself by the laths. The plate of confined air between the two is the most effectual barrier to the passage of heat outward that could be contrived. By making iron walls double or cellular, with a lining of plaster, they might be rendered as warm as wished. Windows are a great source of cold, not merely by admitting cold air, but by allowing the heat to pass by conduction through the thin glass. The air of the room that touches the window is robbed of its warmth, and is constantly descending in a cold stream toward the floor. There is thus a cold influence felt from a window, however close it is. This is partly arrested by window-blinds, shutters, and curtains, which check the flow of the air, and retard its carrying power. But a far more effectual plan is to have double windows: either two frames, or double panes in the same frame. The loss of heat by a double window is said to be only one-fourth of that by a single. Double windows are considered essential in countries where the winters are rigorous.

By carrying those principles far enough, we might succeed in well-nigh imprisoning the heat, and thus produce a house of ideal perfection, so far as mere temperature is concerned. But for the habitation of living beings another condition, seemingly antagonistic to the former, is no less requisite—"air as free as that on a mountain-top."

In general practice the two hostile conditions are not so much sought to be reconciled as compromised; and then, as usual, neither object is well attained. Circulation of air is got accidentally, through the imperfections of structure in our rooms—through the chinks and bad fittings of the windows, doors, floors, and the uneconomical fashion of our fire-places. Were houses much better constructed than they are, the inmates would in many cases be suffocated outright, as they often partially are with the degree of perfection we have already attained. Neither the airing of our houses, nor the art of building them solid and warm, can advance to perfection until the former be no longer left to chance, but be in every case secured by special apparatus capable of direct control. We now proceed to consider how this is sought to be attained; confining ourselves still to the leading principles, and only noticing a few of the specific plans that have been put in practice.

VENTILATION.—The necessity of constantly renewing the air wherever living beings are breathing, arises chiefly from the effects produced upon air in the lungs (see **RESPIRATION**). The average quantity of carbonic acid in expired air or breath is found to be 4.3 per cent by measure. Now this gas, when taken into the lungs, is a poison, and tends to arrest the vital processes. Like other poisons, however, it can be rendered harmless by *dilution*. The small proportion naturally existing in the atmosphere is perfectly innocuous, and may be considerably increased without sensible effect. But it is decidedly prejudicial to breathe for a long time air containing 1 measure in 100 of carbonic acid; and it is considered desirable that the proportion should never exceed 1 in 500. We may assume, then, what is near the truth, that 20 cubic ft. of air pass through the lungs of a man in an hour. To reduce the poison of this to 1 percent, at which point it is barely respirable, it requires to mingle with as much fresh air as will make a mixture of nearly 100 cubic feet; and to make the dilution at all safe, it must be carried five times as far. In other words, the respiration of one human being vitiates hourly about 500 cubic ft. of air.

In addition to carbonic acid, expired air contains an undue amount of watery vapor. Minute quantities of animal matters are also exhaled with the breath, which in close, ill-ventilated apartments form a clammy deposit on the furniture and walls, and, by putrefying, become organic poisons.

A further necessity for the constant renewal of fresh air arises wherever lights are burned. The deteriorated air of a fire goes off by the flue, but lights are generally burned where the product must mingle with the atmosphere of the apartment. Now, a pound of oil in burning consumes the oxygen of 13 ft. of air, and produces a large amount of water in vapor, and also of carbonic acid. Every cubic foot of gas consumes the oxygen of 10 ft. of air, and forms at least 1 foot of carbonic acid, besides watery vapor, sometimes mixed with sulphurous fumes.

To counteract these various sources of pollution, and keep the air sufficiently fresh and wholesome, in rooms where many persons are breathing, it is found in practice that on an average about 20 cubic ft. of fresh air per minute for each individual must be supplied.

Ventilation consists of two operations—the removal of the foul air, and the introduction of fresh. Though neither operation can go on without the other going on at the same time, it is convenient to consider the two separately.

The agents employed in removing the air from apartments are chiefly two: that by which nature effects the ventilation of the earth on a grand scale, viz., the draught of ascending currents produced by difference of temperature; and mechanical force, such as pumping. The former is the more common, and is the only one applicable to private houses.

The column of air in the chimney of a lighted fire-place being expanded and comparatively light, exerts less than the prevailing pressure on the air immediately under and about its base. The air, therefore, below and around it pushes it up, and flows in to take its place; the velocity of the movement being in proportion to the height of the chimney and the degree of heat. Thus, although it is often convenient to speak of the air being *drawn* or *sucked* into the chimney, the force does not lie in the chimney, but in the greater pressure of the air behind.

Wherever, then, there is a heated chimney, there is a means of removing the foul air. And in rooms moderately lofty and spacious, with windows and other fittings not closer than usual, and a chimney mouth of the usual width, there is little risk, when there are only a few inmates, of any serious vitiation of the air. The heated breath that ascends to the ceiling has time to diffuse itself gradually, and be drawn in a diluted state into the currents that are setting from all quarters toward the chimney. These currents, however, are one great objection to this mode of ventilation, as they consist in great part of cold air that has just entered by the doors and windows, and are strongest where the inmates sit to enjoy the fire.

The ascent of foul air to the top of the room dictates its exit in that direction, rather than low down at the mouth of the chimney. It is conceived by some that the carbonic acid of the breath, from its greater weight, must be chiefly at the bottom of the room; but this is a mistake. The heated breath ascends instantly, because it is, as a whole, lighter than the air around it; and the carbonic acid in it does not tend to separate from it and fall down by its superior weight, but, by the law of the diffusion of gases, seeks

to spread itself equally all over the room, and would do so though it were lying at first on the floor. It is on the principle of the foul air ascending at first to the top of a room, that Dr. Arnott's ventilating-valve is contrived. The valve may be used to supplement the open-fire draught in small and crowded apartments, and is essential where the fire is burned in a close stove or in the smokeless grate. The valve is represented at *v*, fig. 1. An aperture is cut in the wall over the chimney, as near to the ceiling of the apartment as may be convenient. In this is suspended a valve, capable of opening inward to the chimney, but not in the other direction, by which means a return of smoke is prevented. The valve is so balanced on its center of motion, that it settles in the closed position, but is easily opened. A flap of 36 sq. in. is sufficient, where there is good chimney-draught, for a full-sized room with company. This simple apparatus may be painted or otherwise made ornamental. It operates by virtue of the draught in the chimney. Whenever that is active from the presence of a fire, the valve is seen to open inward, and a stream of air from the top of the apartment passes through into the chimney, and is carried off. The operation is precisely equivalent to the stream of air always passing into a chimney between the fire and the mantel-piece, but has the great superiority of draining off the most impure air in the room. A wire descends to a screw or peg fixed in the wall, by which the opening of the valve may be limited or altogether prevented. This is a far more efficient plan of ventilation than an open window, or an opening in the wall near the roof, leading merely to the outer air; where there is an open fire in the room, such openings rather admit a rush of cold air than let out the foul.

There is generally more or less draught in a chimney even without a fire, from the air within being slightly warmer than that without; and this action might be strengthened by burning a jet of gas within the ventilating aperture at *v*. Where a house is to be built new, some recommend having special ventilating flues in the walls, separate from but close to the fire-flues, so that the air may be heated, and an ascending current produced. In weather when fires are not required, the draught can be maintained by gas-jets at the entrances to the vents. This plan of causing a draught by gas is applicable to churches and apartments without fire-places.

Where a fire is burned for the express purpose of producing a current of air, it is called ventilation by *fire-draught*. The plan has been exemplified with success in mines, where a fire being lighted at the bottom of a shaft, air is drawn off in all directions around, and sent up the shaft; to replace which, fresh air is constantly pouring down other shafts.

Many of our large buildings are ventilated by fire-draught. A school or church may be ventilated by having the flooring perforated with holes, through which air, warmed by hot-water pipes, passes to the interior. The ceiling is perforated, leading to a chamber which communicates with a vertical flue which leads to the fireplace of the warming-apparatus, situated at the foot of a flue. As the only air which reaches this must pass from the vertical flue, a constant current is maintained therein, and also through the apertures in the ceiling. Dr. Reid exemplified this method, first in his own class-room in Edinburgh, and afterward in various public buildings, among others, in the temporary house of commons, erected after the burning of the old house in 1834. The plan was attended with some inconveniences—in fact, no plan can meet every contingency—but, notwithstanding the storm of hostile criticism that was raised at the time, prof. Tomlinson (*Treatise on Warming and Ventilation*, 1864) gives it as his opinion that “in the case of the temporary house of commons, where all the arrangements were left in his own hands, he succeeded in the proposed object of removing the vitiated air, and keeping up a constant supply of warm or of cool air to fill its place.” The arrangements for warming and ventilating the present house of commons are a modification of Dr. Reid's plan.

In other cases, as at the prison in Millbank, warm air is admitted at the ceiling, and carried off by the draught of a chimney in connection with the sides or lower part of the rooms.

In these last-mentioned instances, the apparatus provides as well for the admission as for the removal of air. In ordinary dwellings no special provision is in general made as to admission. It is, in fact, not absolutely necessary; for the removal of a portion of the air of a room never fails to secure the entrance of a fresh supply somewhere. Whenever the chimney-draught or other means removes a little of the pressure inside the room, the pressure without forces air through every opening and chink; and even, were there no actual openings, would force it through the porous substance of the structure—such as mortar, and even wood itself. But this irregular source of supply has various inconveniences. It often requires more force to strain the air in this manner than the draught is possessed of, and then the chimney smokes; it is smoke produced by this cause that is curable by opening the door or window. Another objection is that impure air is often thus drawn into rooms from the lower parts of the building and from drains about the foundation. For these and other reasons there ought, in all cases, to be a free and legitimate entrance provided for fresh air, so as to give a control over it; and this entrance should be independent of the windows. It is a much disputed point whereabout in a room the air should be made to enter—some advocating openings for it near the floor, others near the ceiling; and it must be confessed that neither method has yet been rendered unobjectionable. One essential thing is to prevent the air from rushing

in with a strong current, by passing it through minute holes spread over a large space. A tube, for instance, leads from the outer air to a channel behind the skirting, or behind the cornice, and the air is allowed to issue into the room through minute holes, or through a long, narrow, and concealed opening covered with perforated zinc or wire-gauze. The passage or tube leading from outside the wall can be more or less closed by a valve regulated from the inside.

But the great difficulty lies in the coldness of the air directly introduced from the outside, whether by the doors and windows, or through channels in the walls, and all such plans of ventilation must be considered as imperfect makeshifts. The fresh air ought in every case to be warmed before being admitted, or, at least, before being allowed to circulate in a sitting-room. In the smokeless grate (fig. 1) the air is led directly from the outer atmosphere into a channel underneath the hearth, and escaping below the fender and about the fire, is warmed before spreading through the apartment. With stoves and Leated pipes, the air should enter about the heated surface; in stoves on the cockle principle, the fresh air, as it enters, is made to pass between the casings of the stove. With an open fire a very feasible plan is to make the fresh-air channel pass behind the fire-place, and allow the warmed air to escape from concealed openings about the chimney-piece and jambs, or from behind the skirting. In Condy's ventilating-grate, the fire-box is constructed of hollow pieces of fire-brick communicating with the external atmosphere and with the room.

For a house with fire-places of the usual construction, perhaps the simplest and most effective expedient is to admit the fresh air into the entrance-hall, and there warm it by means of a low-temperature stove or by hot-water pipes: its passage into the several rooms can then be provided for by regular channels, behind the skirting or otherwise. In America perforations are frequently made in certain parts of the doors, before which silk curtains are disposed, so as to temper the currents. It is almost unaccountable that in this country the plan of warming the lobby and staircase is so seldom resorted to. To say nothing of the comfort thus diffused through the whole house, and the benefit in point of health, especially to weakly constitutions, the economy of the arrangement is beyond dispute. In the sitting-rooms, not more than one-half the usual quantity of fuel requires to be burned in the open fires; and in the bedrooms, as a rule, fires are rendered altogether unnecessary in the coldest weather. It ought to be observed that when air is admitted by a regular and free channel, comparatively little is strained in by the windows and other byways.

Ventilation by Fans and Pumps.—The fan-wheel has been for many years used in factories, to which it is particularly applicable, from the readiness with which it can be kept in motion by the engine. It is essentially the same as the barn-fanners; the air is drawn in at the center of the wheel, and flies off at the circumference by centrifugal force. The fan is placed at the top of a flue, into which branches from all parts of the establishment proceed; and when it is set in motion, it draws off the air from every apartment communicating with it. Dr. Arnott observed that in the fan-wheel as well as in the air-pump or bellows invented by Dr. Hales, a great deal of power was wasted by "wire-drawing" the air—that is, making it squirt through small valves or other narrow openings. To obviate this, he invented a ventilating-pump, which supplied a hospital with fresh air, requiring no other motive power than the descent of the water used in the establishment from a high reservoir to the lower parts of the building. It is described in his work on *Warming and Ventilation*.

Transference of heat from the used air to the fresh.—This is the kind of economy which is put in practice in the respirator (q.v.) and in the caloric engine (q.v.). Whatever difficulties—or impossibilities, as some maintain—there may be in the way of turning this transferred heat into a fresh source of power, nothing seems simpler, in theory at least, than to economize heat in this manner for the warming of dwellings and similar purposes. The idea originated with Dr. Arnott, many years ago, who thus illustrates it in the case of water: Suppose a vessel of boiling water, with a thin metallic tube issuing from the bottom, and having a stop-cock at its extremity; and a similar vessel of water at freezing, the tube of which is larger, and envelopes the other. When both are flowing simultaneously, the hot water, if the tube is long enough, will have lost all its excess of heat before getting to the end of the tube, while the counter-current will have gained all that the other lost. In an experiment with tubes 6 ft. long, the boiling water from the first vessel issued from the pipe at 34°, and the freezing water from the second vessel issued from the pipe at 21°. It is clear that if the first vessel were a bath, the warm water in it, after being used, might in flowing out be made to heat the cold water from a reservoir, flowing into another bath below. We are not aware that the principle has ever been acted upon; but the possible economy of heat is obvious, and it only requires mechanical ingenuity to realize it.

It will at once strike the reader how desirable it would be to do the same with the impure heated air which we are obliged to eject from our dwellings. Where the ventilation depends upon the draught of a common chimney, it would seem impossible to bring the entering air in contact with that which is escaping; but where the mechanical force of a pump or a fan is employed, nothing seems simpler than to make the two currents run counter to one another for a certain distance in close contact through a system of tubes. The smoke even, which, with the most economical arrangements, still issues

from the flues at a temperature considerably above that of the building, might be drawn into the current along with the foul air of the apartments, and the whole reduced nearly to the temperature of the atmosphere before being allowed to escape. Of course there must be loss in the transference; but a large percentage would be saved, and the consumption of fuel would be reduced by that amount. Were this "double-current ventilation" applied to churches, ball-rooms, theaters, etc., where thousands of persons are assembled, Dr. Arnott believed that "no other heating apparatus would be required but the lungs of the company."

Notwithstanding all the improvements recently effected, it is beyond doubt that this important branch of the art of living is still in a very rude and imperfect condition. A writer in the *Quarterly Review* for April, 1866, in a very suggestive article on *Coal and Smoke*, points to the radical error of the existing system, when he remarks that "in a household fire heat is, as it were, manufactured on a very small scale; and experience has proved that the cost of production of an article has always been inversely proportionate to the scale of its manufacture." He accordingly suggests that "it seems practicable, in a great measure, to supersede domestic fires, and to lay on heat (heated air), or the means of generating heat (low-priced gaseous fuel), to our houses pretty much as we now lay on gas." The abatement of the smoke nuisance, and systematic and thorough ventilation, ought to be effected on a similar joint-plan, "by connecting the chimneys of all the houses with underground culverts, provided at intervals with high shafts, in which, if necessary, the draught upward might be increased by furnaces. We have long been familiar with extensive manufactories, covering large areas, in which are very numerous fires, all in communication with a single lofty chimney. With such an arrangement, no visible smoke should be produced, and with due attention a smoky chimney should be impossible." In the case of existing houses, the amount of reconstruction necessary might be a serious obstacle; but in building a new street it might easily be made to empty its entire smoke through the medium of a single tall tower resembling those mediæval campanili which are to be seen in Bologna and other Italian cities." It is further proposed to make the ordinary sewers serve the purpose of culverts for the passage of the smoke to the common chimney. The sulphurous acid of the smoke would destroy the noxious qualities of the sewage gases, and improve the sewage for agricultural purposes; and instead of foul gases escaping through every opening or leak in the sewers, as at present, the powerful suction of the ventilating shafts would draw in fresh air, thus establishing a thorough system of atmospheric sewage. Another effect of the common chimney system would be to make the transference of heat, or double-current ventilation, spoken of above, easily practicable in domestic houses. The pipe through which the heated air and smoke were being drawn away might be made to give up its heat to the counter-current of fresh air which was being drawn in.

Even though such painstaking plans of economizing heat might not pay at the present cost of fuel in this country, it is pleasing to think that there is such a resource in reserve. It is not with all countries as with us; and even our stores of coal are not inexhaustible. It is an unworthy and, in the real sense of the word, an inhuman maxim that bids us "let posterity look to itself." If the absorbing passion for present gain will not let us begin practising economy now, we may at least seek to devise and perfect plans to be in readiness when the necessity comes. It is not uncommon to hear the argument, that before the coals are done, something else will be discovered as a substitute. We are at a loss to imagine what the something is to be, unless it be the ingenuity to make the fuel that is now wasted in a year last a hundred; and this we believe to be quite possible.

WARMING AND VENTILATION (contd.). In its aspect as to health, it may be assumed that no system of heating is advisable which does not provide for a constant renewal of the air in the locality warmed. All heating apparatus depends upon the transference of heat from the fire to the various parts of the building which it is intended to warm, and this transfer may be effected by radiation, by conduction, or by convection. Radiant heat is emitted and absorbed in an accelerating ratio in proportion as the difference of temperature between the radiant and the recipient increases; and, with the same difference of temperature between the recipient and the radiant, the effect of the radiant will be greater according to the increased temperature of the recipient. In other words, the ratio of the emission of heat increases with the temperature. It is thus easier to effect the warming of a given space by means of a highly-heated surface than by a surface emitting a lower temperature. An open fire acts by radiation; it warms the air in a room by first warming the walls, floor, ceiling, and articles in the room, and these in their turn warm the air. Therefore, in a room with an open fire the air of the room is, as a rule, less heated than the walls. In this case the warming of the air depends on the capacity of the surfaces to absorb or emit heat; except that the heat received by the wall may be divided into two parts, one heating the air in contact with the wall, and the other passing through the wall to the outer surfaces, where it is finally dissipated and wasted. Fire-places are sometimes constructed to assist the warming of the air of a room. For instance, in Sylvester's grate, iron bars, of which one end terminates under the fire, are laid so as to form a projecting radiating hearth. The ventilating fire-place warms the fresh air before its admission into the room by means of gills

cast on the back of the grate. In a close stove, heated to a moderate temperature, the heat as it passes from the fire warms the surface of the materials which inclose and are in contact with the fire and the heated gases. The materials next transfer the heat to the outer surface in contact with the air, and the air is warmed by the agency of this outer surface. If heated to a high temperature a stove gives out radiant heat, which passes through the air to warm the objects on which the rays impinge. With hot-water pipes, the heat from the water heats the inner surface of the pipe, and this surface transfers its heat to the outer surface through the material of the pipes. The rate at which the heat can pass from the inner to the outer surface, and be thus utilized instead of passing away straight into the chimney, depends on the heat evolved by the fire, on the extent of surfaces exposed to the heat and their capacity to absorb and emit heat, and on the quality of the material between the inner and outer surfaces as a good or bad conductor of heat. This passage of heat through a body by conduction varies directly with the quality of material, and with the difference between the temperature of the inner surface exposed to the heat and the outer surface exposed to a cooling influence, and inversely as the thickness between the surfaces. Other things being equal, copper is a better material than iron for conveying the heat from the fire to water or air; and coverings of brick-work, wood, or woollen fabrics are better adapted than iron for retaining the heat. The property which appears more than any other to make materials good non-conductors of heat is their porosity to air, and the retention of the air in their pores.

WARMINSTER, a small ancient t. of Wiltshire, on the w. border of Salisbury plain, and 19 m. n.w. of Salisbury. The parish church dates from the reign of Henry III.; and the interesting edifices in the town and neighborhood are numerous. An important corn-market is held every week. Pop. '71, 5,786.

WARNER, CHARLES DUDLEY, b. Mass., 1829; graduated at Hamilton college, 1851. After spending a short time in surveying on the Missouri frontier, he studied law in New York and began practice in Chicago, but in 1860 removed to Hartford, Conn., where he was assistant editor and afterward editor-in-chief of the *Hartford Press*. In 1867 he became assistant editor of the *Courant*, with which he is still connected. He is the author of *My Summer in a Garden* (1871); *Scatterings* (1872); *Back Log Studies* (1872); joint author with "Mark Twain" (Clemens) of *The Gilded Age* (1873), a novel; and author of *Mummies and Moslems* (1876), a book of travels in Egypt. As a writer he has a fine vein of fancy, a delicate humor, and rich thought.

WARNER, SETH, 1743-84; b. Conn.; a leader of the "Green Mountain boys" in the disputes between New York and Vermont, where he had settled in 1765. At the capture of Ticonderoga and Crown Point in 1775 by Ethan Allen, he was second in command. As col. of Vermont forces, he participated in Montgomery's expedition to Canada; and he was commander at the action at Hubbardton in 1777. He was also at the battle of Bennington, and remained in the service till 1782, when ill health forced him to retire.

WARNER, SUSAN, b. New York, 1818; daughter of Henry W., lawyer, of New York. She was the author of *The Wide, Wide World*, published 1850, under the *nom de plume* of Elizabeth Wetherell, immensely popular in this country and in Europe, translated into French, German, and Spanish, in the first 10 years the sale numbering 500,000 copies. *Queechy*, 2 vols. (1852), was almost as well received. She wrote also *The Lure and the Testimony* (1853), a compilation of scriptural texts proving the doctrines of Christianity; *The Old Helmet* (1863); and other works, secular and religious, including *Books of Blessing*, and *Wych Hazel* (1876). Her sister, Anna Warner, writing over the signature of Amy Lothrop, has published a number of popular books, among them *The Fourth Watch* (1872); and *The Other Shore* (1873).

WARNING, in Scotch law, means a notice given to terminate the relation of master and servant, or landlord and tenant; corresponding in England to notice to leave and notice to quit respectively.

WARE, in weaving, signifies the yarn or thread which runs lengthwise in the cloth. See **WEAVING**.

WARPING, a mode of improving land, practiced where rivers bring down large quantities of mud, or where mud is brought up from estuaries by the tide. It is practiced in some of the valleys of the Alps; and the rich soil brought down from the mountains is thus arrested, and made to increase the fertility of fields. It is practiced also in England, on the tidal waters of the Ouse, Trent, and other rivers falling into the Humber. There are not many places in Britain where the process of warping is capable of profitable application. The term warping belongs to the banks of the Humber. The name *arpe* is there given to the large quantity of earthy particles held in suspense by the tidal waters. About a century ago warping began to be practiced by means of small tunnels made through embankments, the water being allowed to remain and deposit its sediment of earthy particles before the sluices were opened for it to flow off. Warping has now long been carried on, upon a larger scale, with large canals, embankments, and flood-gates. Many acts of parliament have been obtained for large warping canals, to lead tide-water over great tracts of land. Land previously sterile and worthless has been covered with good soil, and has become very productive. The "compartment" which

is embanked around, in order to warping, is generally only fifty acres, or less; the farmer warping only one field in the season, because in the meantime it is unproductive. In some cases, however, 500 or 600 acres have been warped in one piece. In the rivers which flow into the Humber, the water coming down the river in floods is unsuitable for warping, and contains no such quantity of sediment as the tidal waters.

WARRANTICE, in the law of Scotland, is the obligation to indemnify the grantee or purchaser of land if, by defect of title, there should be an evictive or paramount claim established against the lands. Warrantice is personal or real; and personal warrantice is subdivided into general and special. Special warrantice is either (1) simple—i.e., that the grantor shall do nothing inconsistent with his grant; or (2) warrantice from fact and deed—i.e., that the grantor has not done and will not do any contrary deed; or (3) absolute warrantice, or warrantice against all deadlly—*contra omnes mortales*—i.e., that the grantor shall be liable for every defect in the right which he has granted. Real warrantice is where the grantor or vender conveys another estate or lands, called warrantice lands, to be held by the grantee in security of the lands originally granted.

WARRANT OF APPREHENSION is an authority given by a justice of the peace to apprehend a person who is charged with a misdemeanor, felony, or treason. It is in the form of a command in her majesty's name, issued by the justice to a constable, and to all other peace-officers of the county, reciting that an offense has been committed, and that oath has been made as to the offender, and commanding the constable to bring the offender before him (the justice), or some other of her majesty's justices, to answer the said charge, and be dealt with according to law. The warrant must be signed and sealed by the justice. It may be issued and executed on a Sunday as well as any other day. In Scotland, the sheriff or justice of the peace who issues a warrant to arrest does not seal the document. In both countries the warrant must name the individual arrested. In England, the party must either be taken or seized, or hands must be laid on him, accompanied with the words, "I arrest you." If the party arrested demand to see the warrant, the constable, if a known officer, is not in strictness bound to show it to him; but if the officer is not a known officer, and not acting within his precinct, then he must show the warrant. It is enough for the constable to say simply that he arrests in the queen's name. If the party to be arrested be in a house, and the doors be fastened, the constable may, after first demanding admittance, and being refused, break open the doors. If, however, the house be a stranger's house, the constable who breaks open the door is not justified in doing so unless the accused be actually within. A general warrant, i.e., a warrant to apprehend all persons suspected, without naming or particularly describing any individual, is illegal and void for uncertainty, for mere vague suspicion is not enough to deprive any man of his liberty. A practice had obtained in the secretary of state's office ever since the restoration, grounded on some clauses in the acts for regulating the press, of issuing general warrants to take up (without naming any person in particular) the authors, printers, or publishers of such obscene or seditious libels as were particularly specified in the warrant. When these acts expired in 1694, the same practice was inadvertently continued in every reign, except the last four years of queen Anne, till the question was raised and decided as to the validity of such warrants, and they were declared by the court of queen's bench illegal. The house of commons in 1766 also passed a resolution making the issuing of general warrants illegal.

WARRANT OF ATTORNEY, in English law, is an authority given by a debtor to some attorney to enter up judgment against him in any action that may be brought to recover a particular debt. It is generally given by a debtor when he finds he has no defense, and wishes to gain time; and if he do not carry out his promise, the effect is that the attorney can immediately sign judgment, and issue execution against him, without the delay and expense of an ordinary action. But to prevent the malpractices of attorneys, and any imposition upon ignorant men, no such warrant is legal unless the debtor had his own attorney present, expressly named by him, and attending at his request, to inform him of the nature and effect of such warrant; and such attorney must subscribe his name as a witness. It is also provided that all warrants of attorney shall be void unless they are filed, within 21 days after execution, with the clerk of the judgments in the queen's bench.

WARRANT-OFFICERS, on shipboard, are the highest grade to which seamen ordinarily attain. They are the gunner, boatswain, and carpenter. Their widows receive pensions.

WARRANTY, in English law, is a promise or covenant to warrant or secure, against all men, a certain person the enjoying of the thing granted or sold to him. As applied to ordinary sales of things personal, it is used to secure the truth of certain representations which the purchaser has no means, or has imperfect means, of ascertaining for himself, and yet the knowledge of which is material to the contract. The law does not imply on the part of the seller of an article in its natural state, who has no better means of information than the purchaser, and who does not affirm that the article is fit for any particular purpose, any warranty or undertaking beyond the ordinary promise that he makes no false representation calculated to deceive the purchaser, and practices no

deceit or fraudulent concealment, and that he is not cognizant of any latent defect materially affecting the marketable value of the goods. In the ordinary sale of a horse, the seller only warrants it to be an animal of the description it appears to be, and nothing more; and if the purchaser makes no inquiries as to its soundness or qualities, and it turns out to be unsound and restive, or unfit for use, he cannot recover as against the seller, as it must be assumed that he purchased the animal at a cheaper rate. And on the sale or transfer of wares and merchandises, if nothing is said as to the character or quality of the thing sold, the buyer takes the risk of all latent defects unknown to the seller at the time of the execution of the contract of sale; all that the seller answers for being that the article is, as far as he knows, what it appears to be. Whenever a man sells goods as owner, he impliedly undertakes and promises that the goods are his own goods, and that he has a right to make the sale and transfer which he professes to make; and if he was not the owner, he is responsible in damages if the real owner claims them from the purchaser. If the purchaser does not himself inspect and select the subject-matter of sale, the seller impliedly warrants the article he sells to be the very article the purchaser has agreed to buy, and is responsible in damages if he furnishes a different article. If the vender is told the article is wanted for a specific purpose, then he is taken to warrant impliedly that the article he furnishes is sufficient for that purpose. Every victualer or dealer in provisions impliedly warrants them to be wholesome and fit for food. But a private person who does not trade in provisions is not responsible for selling an unwholesome article of food without fraud and in ignorance that it is unfit to eat. Where buyer and seller have equal means of knowledge, then the vender is not liable for any representation which he makes without fraud; but if, from the nature of the case, the vender has the exclusive means of knowledge, then he impliedly warrants that what he says is true. Warranty is also to be distinguished from mere matter of opinion or belief. When a servant sells a horse, he has no right to give a warranty, unless his master expressly authorized him to do so. In the law of Scotland, the doctrine of warranty of goods does not substantially differ from the above.

WARREN is a place kept for the purpose of breeding game or rabbits. In its strict legal sense, a right of free warren can only be derived by grant from the crown, and gives certain privileges to the warrenor as to recovering game and destroying dogs which infest it (see Paterson's *Game Laws*, 20); but in the popular sense, a warren merely means a preserve for keeping game and also rabbits.

WARREN, a co. in n.e. Georgia, drained by the Ogeechee and other rivers; 400 sq.m.; pop. '80, 10,885—10,873 of American birth, 6,798 colored. Co. seat, Warrenton.

WARREN, a co. in n.w. Illinois, drained by Henderson's river and Swan's creek; 540 sq.m.; pop. '80, 22,940—20,759 of American birth, 291 colored. Co. seat, Monmouth.

WARREN, a co. in w. Indiana, bounded on the s.e. by the Wabash river; 360 sq.m.; pop. '80, 11,497—11,047 of American birth, 19 colored. Co. seat, Williamsport.

WARREN, a co. in s. Iowa, drained by affluents of the Des Moines; 576 sq.m.; pop. '80, 19,578—18,636 of American birth, 63 colored. Co. seat, Indianola.

WARREN, a co. in s. Kentucky, bounded on the n. by Green river; 580 sq.m.; pop. '80, 27,528—27,081 of American birth, 7,640 colored. Co. seat, Bowling Green.

WARREN, a co. in w. Mississippi, having the Mississippi river for its w. boundary; 650 sq.m.; pop. '80, 31,242—30,138 of American birth, 22,529 colored. Co. seat, Vicksburg.

WARREN, a co. in e. Missouri, having the Missouri river for its s.w. boundary; 450 sq.m.; pop. '80, 10,806—8,917 of American birth, 954 colored. Co. seat, Warrenton.

WARREN, a co. in n.w. New Jersey, having the Delaware river for its w. and n.w. boundary; 350 sq.m.; pop. '80, 36,588—33,827 of American birth, 351 colored. It contains Blue mountain and Jenny Jump mountain, crossing it from n.e. to s.w.; and Delaware water gap in the n.w. Co. seat, Belvidere.

WARREN, a co. in e. New York, having lake George for its e. boundary; drained by the Hudson and Schroon rivers; 900 sq.m.; pop. '80, 25,180—22,684 of American birth, 62 colored. Among its mineral products is black marble, found at Glens Falls. Co. seat, Caldwell.

WARREN, a co. in n. North Carolina, drained by the Roanoke and other rivers; 450 sq.m.; pop. '80, 22,619—22,439 of American birth, 16,332 colored. Co. seat, Warrenton.

WARREN, a co. in s.w. Ohio, drained by the Great Miami and the Little Miami rivers; 370 sq.m.; pop. '80, 28,392—26,995 of American birth. Co. seat, Lebanon.

WARREN, a co. in n.w. Pennsylvania, drained by the Alleghany and other rivers; containing valuable petroleum wells; 880 sq.m.; pop. '80, 27,981—23,302 of American birth, 196 colored. Co. seat, Warren.

WARREN, a co. in central Tennessee, bounded on the e. by the Caney fork of the Cumberland and Rock river; 370 sq.m.; pop. '80, 14,079—14,027 of American birth, 2,278 colored. Co. seat, McMinnville.

WARREN, a co. in n. Virginia, having the Blue Ridge mountains on the s.e. boundary, forms a part of the Great valley of Virginia; 270 sq.m.; pop. '80, 7,399—7,361 of American birth, 1441 colored. Co. seat, Front Royal.

WARREN, GOUVERNEUR KEMBLE, b. N. Y., 1830; graduated at West Point, 1850, and was commissioned in the engineers. He was employed in topographical work in the Mississippi valley, in the Pacific railroad explorations, and in Dakota and Nebraska; from 1859 to 1861 was assistant prof. of mathematics at West Point, and then became lieut.col. of a New York zouave regiment. He had commands at Big Bethel in the peninsular campaign and at the battles of Manassas, Antietam, Fredericksburg, Chancellorsville, and Gettysburg; was Hooker's chief topographical engineer, and chief engineer of the army of the Potomac. At Five Forks he led the combined 1st and 5th corps, and in the last year of the war had charge of Petersburg, and later, the Mississippi department. He left the volunteer service with rank of brevet maj.gen. and maj. of engineers in the U. S. army. He has since had charge of the construction of many fortifications, bridges, and harbor and river improvements.

WARREN, HENRY, president of the institute of painters in water-colors, was b. in London, Sept. 24, 1798. Warren's father inherited considerable wealth, which, however, he contrived to dissipate, and his children were left to shift for themselves. The subject of this memoir at first got a situation in a counting-house; but afterwards, having an intense love for art, was placed in the studio of Nollekens, the celebrated sculptor of the day. At Nollekens's, he was associated with Bonomi and Gibson. Through Benjamin West, Warren obtained an introduction to the sculpture-room of the British museum, where he practiced both drawing and modeling, and where he used to meet Haydon's pupils, Bewick, Christmas, and the Landseers. In 1818 he became a student of the royal academy, where he attended regularly for many years in the company of Etty, the Landseers, F. R. Lee, Webster, and others less distinguished. Warren's first paintings were in oil. He exhibited several of these from time to time at the academy. One was a subject from Collins's *Ode to the Passions*. Etty thought very highly of this picture, and Warren repeated it in water-color, and sent it for exhibition to the "New Society of Painters in Water-colors," of which he became a member at its foundation in 1825. Of this society, now known as the "Institute of Painters in Water-colors," Warren has been president for the last thirty years, during which time, both by his teaching and example, he has done much toward raising the English school of water-color drawing to the proud eminence that it now occupies in comparison with the same branch of art in foreign countries—namely, the highest place of all. Warren's first great picture in water-colors was "The Happy Valley," from *Rasselas*—a piece embodying both landscape and figures, and displaying great power both in its composition and coloring. A great many of his subsequent pictures are on eastern subjects, leading some persons to suppose that he has lived a long time, or at least traveled much, in Egypt, the Holy Land, Arabia, etc. But this is not the case. Among these eastern subjects many are scriptural, as "Rebecca at the Well," "Hagar and Ishmael cast out into the Wilderness," "Christ and the Woman of Samaria," "Joseph's Coat brought to Jacob," "Christ with his Disciples in the Cornfield," "The Death of the First-born," "The Flight into Egypt." Of eastern subjects not scriptural may be named "The Dying Camel in the Desert," well known by the engraving so deservedly popular; "A Halt in the Nubian Desert," "Moslem Charity," "The Crusaders' First Sight of Jerusalem," and "The First Sunset witnessed by our First Parents." This picture, with its beautiful landscape and admirably drawn figures, is said by a good authority to be "worthy of being classed with the best works of John Martin and Danby." Of subjects not eastern there may be mentioned "Alfred in the Swineherd's Cottage," "The Warrant exhibited to the Lady Abbess of a Benedictine Nunnery for the Suppression of her Convent," "Incipient Courtship," "Happy Nutting Days," etc., besides numerous English landscapes done from nature with much feeling and truthfulness. Warren is an honorary member of the "Société Belgique des Aquarellistes," and of the "Pennsylvanian Academy of Arts;" he is also prof. of the fine arts at Queen's college, London. He was one of the committee of selection in the fine arts department for the great international exhibition at Paris in 1855; again for that of London in 1862; and for that of Paris again in 1867. Warren has written a little book on *Artistic Anatomy*, which has gone through many editions; also a book on *Water-color Painting*; two funny books, *Notes upon Notes*, and *Hints upon Hints*; and an antiquarian work, *On the River Ravensbourne*. In 1829, Warren was married to Isabella, niece of John Martin the painter, and has a son, Edmund George, also a water-color artist, whose drawings of landscape—especially when he deals with woodland scenery—have, by their originality and truthfulness, placed their author in the foremost rank of landscape painters.

WARREN, JAMES, 1726-1808; b. Mass.; graduated at Harvard in 1745. He was a merchant, who succeeded to a handsome estate on the death of his father in 1757. He also succeeded his father as high-sheriff of Plymouth county. He was elected to the legislature in 1766, and warmly advocated the rights of the colonists. He became president of the provincial congress on the death of gen. Joseph Warren, and was for a time paymaster-gen. of the continental army. He was afterward speaker of the Massachusetts house of representatives.

WARREN, JOHN, 1753-1815; b. Mass.; graduated at Harvard, 1771; studied medicine, and settled at Salem, Mass. He took part in the battle of Lexington, and in June became a hospital-surgeon, afterward going to the front. He was also with gen. Greene in 1778, and in the forces sent against Shay in 1786. He was one of the founders of the Harvard medical school, in which he was professor of anatomy. He delivered, in 1783, the first of the Boston 4th of July orations.

WARREN, JOHN COLLINS, 1778-1856; b. Boston; graduated at Harvard in 1797. He studied medicine with his father (Dr. John), and in London and Paris. He began practice in Boston in 1802, and soon rose to eminence. He was assistant-professor of anatomy and surgery at Harvard university, 1806-15; full professor, 1815-47; and professor emeritus, 1847-56. He was one of the founders and long an editor of the *Boston Medical and Surgical Journal*. He was also one of the founders of the McLean asylum for the insane, and of the Massachusetts general hospital, of which he was long chief-surgeon. In 1846 he used ether in surgery for the first time. He made a fine collection of specimens in anatomy and paleontology, now known as the Warren museum. Among his works are *Diseases of the Heart* (1809); *Comparative View of the Sensorial System* (1820); *Etherization* (1848); and *Mastodon Giganteus* (1855).

WARREN, JONATHAN MASON, 1811-67; b. Boston; graduated at Harvard, took the degree of M.D., and studied surgery in London and Paris. He was long attending-surgeon to the Massachusetts general hospital. His *Surgical Observations with Cases and Operations* was published in 1867.

WARREN, JOSEPH, 1741-75; b. Roxbury, Mass.; graduated at Harvard in 1759, and became a physician in Boston in 1764. He took the place of Samuel Adams as orator at the 2d anniversary of the Boston massacre, and delivered an excellent address. In 1772 he was a member of the committee of correspondence. He was a member of the Suffolk county convention, which was called to oppose gov. Gage's proposed fortification of the s. entrance to Boston harbor, and as chairman of the committee appointed to remonstrate with Gage on that subject, drew up two papers, which were afterward laid before congress. In 1774 he was a member and president of the Massachusetts congress, and chairman of the committee of public safety. In March of the next year he was again the orator at the anniversary of the massacre. He had much to do with the success at Lexington, and in June, 1775, was commissioned maj.gen. He opposed the occupation of Charlestown heights, advocated by Putnam and Prescott, thinking the American supply of ammunition too small to repel an attack. Overruled by a majority of the council, which resolved to fortify Bunker hill, he went there as a volunteer, refusing to take the chief command offered to him by both Prescott and Putnam. As he was leaving the field among the last, he was killed by a ball in the forehead.

WARREN, MERCY (OTIS), 1728-1814; b. Mass.; sister of James Otis; wife of gen. James Warren. She was active in the revolutionary movement, and carried on a correspondence with the chief public men of her time. She wrote *The Adulator*, a tragedy (1773); *The Group* (1775), both satirizing the royalists; *Poems, Dramatic and Miscellaneous* (1790); and a valuable *History of the Rise, Progress, and Termination of the American Revolution* (1805).

WARREN, SIR PETER, 1711-75; b. England; entered the navy when a boy, and gradually rose in rank until he became commodore. In 1745 he commanded the squadron which captured Louisburg, and two years later gained a complete victory over a French fleet. For this service the electors of Westminster returned him to parliament.

WARREN, SAMUEL, D.C.L., 1807-77; b. Raere, Denbighshire, Scotland; son of Samuel, LL.D.; studied medicine at Edinburgh, taking the prize on comparative jurisprudence. In 1828 he began the study of law at the Inner temple, London; practiced as a special pleader, 1831-37; in the latter year was called to the bar. "Passages from the Diary of a late Physician," translated into French, he contributed to *Blackwood's Magazine*, 1830-31. He was conservative in politics, a strong supporter of lord Derby, and published "Ten Thousand a Year" in *Blackwood's*, 1839, in the interest of that party. Other publications are *Now and Then*, a novel (1847); *The Lily and the Bee* (1851), a poem, on the opening of the Crystal palace. In the same year he became queen's counsel; recorder of Hull, 1854-74; member of parliament from Midhurst, 1856; re-elected, 1857; resigned, 1859, having been appointed master in lunacy by lord Chelmsford.

WARREN, WILLIAM, b. Philadelphia, 1812; made his first appearance on the stage the Arch-street (Philadelphia) theater, as "Young Norval," in which his father had made his *début*. In 1847 he became a member of the company at the Boston museum, with which he is still (1881) connected. Though little known outside of New England, he is one of the best comedians on the American stage.

WARREN, WILLIAM FAIRFIELD, D.D., b. Mass., 1823; graduated Wesleyan university, Middletown, Conn., 1853; ordained and joined the New England Methodist conference, 1855; studied at Andover theological seminary, Berlin, and Halle; traveled in the east; elected professor of theology in the Boston Methodist theological seminary, 1866; president of the Boston university, 1873; elected bishop, 1880. He has published works on logic and systematic theology. As a scholar he holds high rank.

WARRICK, a co. in s.w. Indiana, bounded on the s. by the Ohio river, producing in one year 3,611,775 lbs. of tobacco; 380 sq.m.; pop. '80, 20,162—18,893 of American birth, 617 colored. Co. seat, Booneville.

WARRINGTON, a parliamentary and municipal borough and manufacturing t. of Lancashire, on the right bank of the Mersey, 16 m. e. of Liverpool by railway. After the parish church, which is of Saxon origin, the chief buildings to be mentioned are the cotton and other factories, and the cloth-halls. In the older streets ancient wooden houses are even yet to be seen. The manufactures of Warrington comprise cotton-goods—as fustians, twills, corduroys; chemicals; files and other tools, pins, wire, and wire-woven work; glass; leather and soap; and a famous ale is brewed. Vessels of 100 tons can ascend the Mersey as far as the bridge of this town. Population of parliamentary borough, which returns one member to parliament, 1871, 33,053.

WARRINGTON, LEWIS, 1782–1851; b. Va.; graduated William and Mary college, 1798; midshipman in the navy, 1800; was lieutenant on the Chesapeake in her encounter with the British frigate *Leopard*, 1807; as master of the sloop *Pacock*, captured the British sloop-of-war *Esperrier*, off cape Canaveral, Fla.; received for this a gold medal from congress; took 14 British merchantmen, mostly in the bay of Biscay, 1814; became capt.; went to India; captured the English cruiser *Nautilus* in the straits of Sunda, 1815; commanded a squadron in the West Indies; was a member of the navy commission board, 1827–30; chief of ordnance and hydrography, 1842, till his death.

WARSAW, a government of Russian Poland, adjoining Prussia, watered by the Vistula, Bzura, and Pilica rivers; about 5,600 sq.m.; pop. '70, 925,639. The surface is level, and generally fertile. Capital, Warsaw.

WARSAW, formerly the capital of Poland (q.v.), now capital of the Russian, or rather Russianized, government of Warsaw, stands on the left bank of the Vistula, about 300 m. e. of Berlin by railway. Lat. of observatory, 52° 13' n., long. 21° 2' east. It stands partly on a plain, partly on rising ground sloping upward from the left bank of the river, extends over a wide area, and consists of the city proper, and a number of suburbs, several of which are beautifully built. A bridge of boats 1626 ft. long connects Warsaw with the suburb of Praga, on the right bank of the Vistula. The streets are mostly narrow, though in several instances they are broad and handsome. The Vistula at Warsaw is broad, shallow, and ever-changing in its sandy course, and is navigable for large vessels only when, after thaw, rivers of melted snow pour down into it from the Carpathians, or when it is swelled by the autumn rains. But the only craft seen here on the Vistula are rude rafts, usually laden with wheat, which they convey to Danzig by river, and (within the last few years) steamers at intervals. Seen from Praga, on the right bank, the castle, standing on a steep ascent, has a most imposing effect. Attached to the Saxon palace are a spacious court and gardens, which are considered the finest promenade in the city. Among the other buildings there are nearly 30 palaces; the cathedral of St. John (dating from 1250), a Gothic building of great beauty, containing statuettes and many interesting monuments, among which is one by Thorwaldsen; the Lutheran church, the loftiest building in Warsaw, and numerous other places of worship, including synagogues. There are several large and memorable squares, as the Sigismund square, containing the monument, erected by Ladislas IV., in honor of his father, Sigismund III. In this square, in April 8, 1861, 40 unarmed and unresisting Poles were massacred. The citadel, erected by the emperor Nicholas, for the express purpose of intimidating, and, if necessary destroying the city, commands, from its situation, every part of Warsaw. The university, broken up by the emperor Nicholas after the insurrection of 1830, was re-established by decree, 1864, through the influence of the grand duke Constantine; and besides this institution, there are several minor colleges, gymnasiums, etc. Woolen and linen fabrics, chemicals, sugar, and leather are manufactured. Pop. '77, 308,548 (50,000 being Jews).—The government of Warsaw has an area of 5,600 sq.m., and pop. of '70, 925,639. For the history of Warsaw, see POLAND, JOHN III., etc.

WARTBURG. WAR OF THE, the name given both to a grave poetic contest, which is represented to have taken place on the Wartburg, and also to a poem in the Middle High-German dialect, which commemorates the event. At the time when the aforesaid dialect had attained its highest literary development, and its poets enjoyed a brilliant reputation, Hermann, the munificent Landgraf of Thuringia, had made his court a sort of refuge or home for the *irritable race*, as well as for many other people. It could hardly fail, under the circumstances, that quarrels and jealousies should abound; and, in fact, allusions to these are sufficiently distinct in several of the most distinguished writers who lived at the Thuringian court—e. g., in Wolfram von Eschenbach and Walther von der Vogelweide. But soon after the conception of these things underwent a sort of mythical transformation, and the occasional temporary and natural rivalries of the poets were changed into a particular and premeditated contest for superiority in poetic skill; and to the list of those poets who actually had intercourse with each other at Eisenach were now added others partly historical, and in part purely fictitious characters—e. g., the virtuous Schreiber, Bitterolf, Reinmar (subsequently confounded with Reinmar von Zweter), the almost mythical Heinrich von Ofterdingen, and the wholly mythical Mas-

ter Klingsor, the Transylvanian magician and astrologer. On the basis of this historico-mythical tradition, and under the formal influences of the then much admired songs of emulation, riddle-contests, and ecclesiastical plays, there was composed, about the year 1300, a strange, obscure, unharmonious poem in two parts, called *Krue von Wartburg*. In the first of these, executed in a long and artistically managed measure, and entitled *Time des Fürsten von Thuringia*, Heinrich von Ofterdingen challenges the other poets to a contest in verse—the fate of the vanquished to be death—and asserts the excellence of Leopold, duke of Austria, over all the other princes. Victory, however, inclining to the Eisenachers, Heinrich calls in Klingsor to his aid, who, on his part, fights his verse-battle against Wolfram by the assistance of evil spirits, with riddles and dark science. With distinct reference to Klingsor's "black art," the simpler and shorter measure of this second part is called *Schwarze Ton*. Throughout the whole poem, which may be regarded as the first attempt at a secular drama, but which is rather an intermediate link between the lyric contest and the drama, one may trace an unmistakable imitation of Wolfram's style of poetry. The author is unknown. From the inequality of the style one is disposed to conclude that several hands were employed in its composition. The poem, which has been much overrated in modern times, does not seem to have exercised any particular influence on literature. In a prose form the story of the Wartburg contest first appears—in the Thuringian chronicles—after the beginning of the 14th c., and probably owes its origin to the poem. The poem was printed in a separate edition by Ettmüller (Ilmenau, 1830), and is also to be found in Bodmer's and Von der Hagen's collection of the *Minnesinger*.—See Von Plotz, *Über den Sängerkrieg auf Wartburg* (Weimar, 1851).

WARTHÉ, the longest and most extensively navigable affluent of the Oder, rises on the s.w. frontier of Poland, 35 m. n.w. of Cracow. In Poland it flows n. and w., and the length of its course in this country is 300 miles. It then flows w.n.w. through Prussia for 180 m., passes Posen, and joins the Oder at Kustrin, where it is 620 ft. broad. Total length, 483 m., of which it is navigable.

WART-HOG, *Phacochærus*, a genus of *suidæ*, closely resembling the true hogs in most of their characters, and particularly in their feet, but remarkably differing from them in their dentition; the molar teeth being much like those of the elephant, and replacing one another in the same manner. There are two triangular incisors in the upper jaw, and six small ones in the under; the tusks are lateral, very large, project far from the mouth, and are bent upward; there are six or eight molars in each jaw. The head is very large, and the muzzle very broad; the cheeks furnished with large wart like excrescences, so that the appearance is altogether very remarkable and uncouth. The species are all natives of Africa. They feed very much on the roots of plants, which they dig up by means of their enormous tusks. The **AFRICAN WART-HOG**, or **HAUJA** (*P. Mand.*), a native of Abyssinia and of the central regions of Africa, from the coast of Guinea to that of Mozambique, is nearly 4 ft. long, with a naked slender tail of one foot, is scantily covered with long bristles of a light brown color, and has a mane sometimes 10 in. long, extending from between the ears along the neck and back. Another species is found in the s. of Africa (*P. Ethiopæus* or *pallasi*), the **rark rark** of the Dutch colonists at the cape of Good Hope. The incisors of the latter fall out at an early age, those of the former are persistent.—A closely allied genus is *potamochærus*, of which there are several species, as the **bosch rark** of Cape Colony (*P. Africanus*), which is nearly black, with whitish cheeks having a central black spot; and the **PAINTED PIG** of West Africa (*P. penicillatus*), which is reddish, with black face, forehead, and ears. The species of *potamochærus* frequent swampy grounds, and sometimes receive the name of **WATER-HOG**. They have longer ears than the true water-hogs, tapering and ending in a pencil of hairs; the face is elongated, and has a huge protuberance on each side. The flesh of all the wart-hog and water-hogs is in high esteem. They are hunted by dogs, which are often killed in the encounter with them. They are much addicted to fighting among themselves.

WARTON, JOSEPH, D.D., was born at Dunsfold, Surrey, in 1722. His earlier education he received from his father, the rev. Thomas Warton, sometime professor of poetry at Oxford. At the age of 14 he was sent to the great school at Winchester, whence, in 1740, he was transferred to Oriel college, Oxford, where, four years afterward, he took his degree of B.A. After passing the intermediate years as a curate at Chel-sea and elsewhere, in 1748 he was presented by the duke of Bolton to the rectory of Winsdale, near Basinstoke, a living of no great value, yet sufficient to determine his marriage with a Miss Damon, to whom he had been engaged. Previous to this he had become known as a writer of verse in the *Gentleman's Magazine*, Dodsley's *Museum*, &c., and as the author of a volume of *Odes and other Poems*. In 1751 he went abroad with the duke of Bolton; and after his return he issued, in 1753, an edition of Virgil, with a translation of the *Eclagues and Georgics*. This, with the critical notes and dissertations appended to the work, met with great approval, and subsequently procured him from the university of Oxford the degree of M.A. In 1756 appeared the first volume of his chief literary performance, the *Essay on the Writings and Genius of Pope*, the second and concluding volume of which was not given to the world till 1782. Venturing, as he did, to question the positive supremacy which it was then fashionable to attribute to Pope, Warton

did not by this work attain any very instant increase of popularity; but the value in relation to the literature of the time, of the critical principles announced in it, as also in his other more casual essays, has since been sufficiently recognized. In 1755 Warton was appointed second master of Winchester school, of which he became head in 1766. Soon after, he revisited Oxford, and had conferred on him the degrees of bachelor and doctor of divinity. Of preferment in the church, he had subsequently his full share. By the good offices of Dr. Lowth, bishop of London, he was made, in 1782, a prebendary of St. Paul's; and the living of Thorley, in Hertfordshire, was conferred on him. He obtained besides, in 1788, a prebend in Winchester cathedral, and the rectory of Easton, which he soon after exchanged for that of Uplam. The mastership of Winchester he resigned in 1793, and devoted himself to the preparation of an annotated edition of Pope, which was completed in 9 vols. 8vo in 1797. At his death, Feb. 23, 1800, he was engaged on a similar edition of Dryden, of which he had published two volumes. Though Warton's reputation has not survived as a poet, yet it certainly has as a critic, along with that of his more distinguished brother.—See *Biographical Memoirs of Rev. Joseph Warton, D.D.*, by rev. John Woolf, A.M. (1806).

WARTON, THOMAS, the younger brother of the preceding, was born in 1728, at Basingstoke, in Hampshire, of which place his father had then become vicar. His earlier education he received chiefly at home from his father; and in 1743 he was entered at Trinity college, Oxford, where, in 1750, he took his degree of M.A. The year after, he obtained a fellowship. He remained at the university, employed as a tutor; and in 1757 he was made professor of poetry, in which capacity he was much esteemed as a lecturer. In 1767 he took his degree as bachelor of divinity, and was soon after presented to the living of Kiddington by the earl of Lichfield. In 1782 that of Hill Farnance, in Somersetshire, fell to him by favor of his college; and these two unimportant pieces of ecclesiastical preferment were the only ones he ever enjoyed. Very early he became known as a poet, and in 1754 he published a volume entitled, *Observations on the Faerie Queene of Spenser*, which established his reputation as one of the first critics of the day. In a second edition of the work, issued in 1762, it was expanded into two volumes. Of Warton's miscellaneous literary activity, no account need be given in detail. The work by which he is now chiefly remembered is his *History of English Poetry*, the first volume of which was published in 1774. Two other volumes followed in 1778 and 1781, but at his death the work remained unfinished. In its wealth of information regarding the earlier portion of our literature, the book remains to this day unrivalled. As a poet, also, Warton takes distinct, if not very high rank. In 1777 he published a collection of such of his scattered pieces as he deemed most worthy of being reprinted, and the acceptance it met with is shown in the successive editions of 1778, 1779, and 1789, as also in the fact, that on the death of Whitehead, the poet-laureate, Warton had the honor, such as it might be, of being selected to succeed him in the office. The last work on which he was engaged was an elaborately annotated edition of the minor poems of Milton. Of this, published in 1785, a carefully prepared re-impression was issued the year after his death, which took place suddenly on May 21, 1790. In 1802 a new edition of his poems was published, with a life of the author by Mr. Mant.

WARTS (sometimes known in surgery by their Latin name *verrucae*) are collections of lengthened papillae of the skin (q. v.), closely adherent and ensheathed by a thick covering of hard dry cuticle. From friction and exposure to the air, their surface presents a horny texture, and is rounded off into a small button-like shape. Such is the description of the simple wart, which is so commonly seen on the hands and fingers (and rarely on the face or elsewhere) of persons of all ages, but especially of children. Among other varieties of warts are: (1) One to which the term *verruca digitata* has been applied. It is more elongated in shape, and less protected by cuticle than the preceding. It is said to occur nowhere but on the scalp of women of adult age, and sometimes to occasion great annoyance in brushing and combing the hair. (2) *Subungual warts*, growing, as their specific name implies, beneath or at the side of the finger or toe-nails. They originate beneath the nail, and as they increase, they crop out either at the free extremity or the side of the nail, and are usually troublesome, and often very painful. They are generally of syphilitic origin. (3) *Venercal warts*, caused by the direct irritation of the discharges of gonorrhoea or syphilis, and occurring about the parts which are liable to be polluted with such discharges. They attain a larger size, and are more fleshy and vascular than other warts.

Nothing is known of the causes of warts further than the third variety is induced by an irritating discharge, that the malignant form of wart which is the beginning of chimney-sweepers' cancer is caused by the irritation of soot, and that persons engaged in dissection and *post-mortem* researches are especially liable to them; hence we may infer they are always due to some local irritation. Venercal warts are certainly contagious; with regard to others, we cannot speak positively. In some cases, but not invariably, blood from a wart is capable of producing similar warts when applied to the skin. In consequence of the capricious way in which warts often spontaneously disappear, there are numerous popular charms for their removal, several of which may be found recorded in the pages of *Notes and Queries*. Common warts are so apt to disappear, that

they may be often left to themselves. If it is desired to remove them, glacial acetic acid is perhaps the best remedy; it must be applied with a camel-hair pencil till the wart is pretty well sodden, care being taken not to blister the neighboring skin. One or at most two applications are usually sufficient. Nitrate of silver and tincture of iron are popular and general applications. Small warts hanging by a neck, may often be very simply removed by the moderately tight application of an elastic ligament (for example, a small broken elastic ring) to the base. The wart usually shrivels up, and falls off within a week. The other varieties of warts must be left to the surgeon.

WARWICK, a co. in s.e. Virginia, having the James river on the s.w.; 80 sq.m.; pop. '80, 2,257—2,247 of American birth, 1479 colored. Co. seat, Warwick Court-House.

WARWICK, a municipal and parliamentary borough, chief t. of the county of the same name, stands in the middle of the county, on the *Avon*, 20 m. s.e. of Birmingham. It is a very ancient town, and contains many ancient and interesting buildings and institutions. Of these the most notable is Warwick castle, the principal residence of the earls of Warwick, beautifully situated on a rocky elevation, 40 ft. high, on the banks of the *Avon*. Of this edifice, Guy's tower, 128 ft. high, was built in 1394; and Caesar's tower, still more ancient, is 147 ft. high. The interior, before the castle was partly burned, Dec. 3, 1871, was remarkable for its splendor and elegance, and has been restored in similar style. The earl of Leicester's hospital for aged brethren has an annual income of £2,016. There are numerous other charities, with schools, libraries, etc. Agriculture and general trade afford employment to a large number of the inhabitants. Warwick returns two members to the house of commons. Pop. '71, 10,986.

WARWICK, a township of Rhode Island, 10 m. s.w. of Providence, on Narragansett bay, and the Stonington and Providence railway, containing the villages of Natick, Phenix, Centreville, Arctic, Crampton, and Apponaug. It has 22 cotton-mills with 160,000 spindles and 4,000 looms, 2 woolen mills, 2 bleacheries, 2 print-works, 15 churches. Drum rock, a balanced rock of great size, can be moved by a child, and makes a sound which can be heard for miles. Pop. '70, 10,453; '75, 11,614.

WARWICK, GUY, Earl of, a hero of early English legend. He is said to have lived in Saxon times, during the reign of Athelstan in the 10th century. There is no reason to believe that he ever lived at all. The legend of Guy is of Anglo-Norman origin, but does not go back, so far as known, beyond 1300. Chaucer alludes to sir Guy in the *Canterbury Tales*, and Shakespeare in *Henry VIII.* (if that work be his), to sir Guy and Colbrand, a Danish giant, whom Guy fought.

WARWICK, RICHARD DE BEAUCHAMP, 12th Earl of, 1381-1439; succeeded to the title in 1401. He participated in the war with Owen Glendower and the Percys, and was at the battle of Shrewsbury. In 1413 he went to France as a commissioner to treat for peace, and the next year attended the council of Constance. In 1415 he was capt. of Calais, and, 1418, ambassador to Burgundy. He was presently made earl of Aumerle. He was regent of France, 1425-28, and of France and Normandy, 1437-39.

WARWICK, RICHARD NEVILLE, Earl of, K.G., popularly named the king-maker, was eldest son of Richard, earl of Salisbury, and Alice, daughter and heiress of Thomas Montacute. He was born about 1420, shortly before the accession of Henry VI. Lord Richard Neville, as he was then styled, early manifested his distinguished bravery and brilliant personal qualities in a hostile incursion across the Scottish marches, in which he accompanied his father, the earl of Salisbury. He became the most powerful nobleman in the kingdom, by his marriage with Anne, daughter and heiress of Richard de Beauchamp, earl of Warwick. He not only acquired by this alliance the broad lands of the Warwick family, but was created earl of Warwick, with succession to the heirs of his wife. He is the most prominent figure in the civil war of the roses, one of the darkest periods of English history. The duke of York gained his support by his marriage with lady Cecille Neville; and when the barons declared the incapacity of Henry VI., and chose the duke to be protector of the kingdom, Warwick led into the field his well-tried borderers of Wales. The Yorkists and the Lancastrians first met at St. Albans in 1455, when Warwick, rushing suddenly into the town at the head of his men, mainly won the battle by his impetuous onset. He was rewarded with the government of Calais—"then," says Comines, "considered as the most advantageous appointment at the disposal of any Christian prince, and that which placed the most considerable force at the disposal of the governor." He also obtained command of the fleet for five years. In 1458 he sailed from Calais with five large and seven small vessels, and attacked a fleet of 28 ships, belonging to the free town of Lübeck. After a battle of 6 hours, he took 6 of the enemy's vessels. In 1460 he landed in Kent at the head of 1 troops, and entered London amid the acclamations of the people. He defeated the queen's army, near Northampton, with great slaughter, and obtained possession of the person of the king. Richard, duke of York, now advanced his claim to the throne. Queen Margaret raised an army to rescue the king; and the duke committed the idiotic monarch to the custody of the duke of Norfolk and Warwick, while he advanced to Wakefield to attack the Lancastrians. The duke was taken, and put to death; and Warwick's father, the earl of Salisbury, with twelve other Yorkist

chiefs, was beheaded at Pontefract. Another battle at St. Albans was won by the Lancastrians; but Edward, earl of March, now duke of York, accompanied by Warwick, marched boldly upon London, which was throughout Yorkist, and Edward was proclaimed king by the style of Edward IV. The next battle was that of Towton, near York. The Lancastrians had retaken the pass of Ferrybridge, on the river Aire, and Warwick, in despair at the loss of so good a position, rode up to Edward, and dismounting, shot his own horse through the head, as a signal for an attack from which there could be no retreat, exclaiming: "Sir! let him flee who will flee; but by this cross" (kissing the hilt of his sword) "I will stand by him who will stand by me!" The Lancastrians were defeated with immense loss; and Edward, returning to London in triumph, was crowned June 22, 1461. The battle of Hexham was followed by the capture of Henry; and Warwick, who had been left in command in London, placed the deposed king on a horse, under whose belly his feet were fastened, and thus led him through Cheapside to the tower. Warwick having been authorized to negotiate with Louis XI. of France for the marriage of his sister-in-law, the princess Bonne, of Savoy, to king Edward, could not brook the king's sudden marriage with Elizabeth Woodville, and seemed inclined to show that he could pull down as well as set up kings. He was now at the height of his power. To the earldoms of Warwick and Salisbury, with the estates of the Spencers, he added the offices of high-admiral and great-chamberlain, together with the lord-lieutenancy of Ireland and the government of Calais. Comines states the income of his offices at 80,000 crowns a year, besides the immense revenues accruing from his patrimony; yet he had the meanness to accept a secret pension and gratuities from Louis XI. After being sent into honorable banishment by means of embassies to France, Burgundy, and Brittany, he gave his daughter in marriage to George, duke of Clarence, without asking Edward's permission. He soon afterward broke out into revolt against Edward, and concluded a treaty with queen Margaret, by which it was agreed that her son, prince Edward, should espouse Anne Neville, Warwick's daughter, and that in failure of issue, the crown should devolve on Clarence. King Edward escaped to Holland, and Henry VI. resumed the sovereignty. Edward, however, raised a body of Flemings and Dutchmen, and, landing near Hull, advanced toward London. He gave battle to king Henry's army, commanded by Warwick, at Barnet, April 14, 1471. The battle was memorable and important. Warwick and his brother, Montague, were left dead on the field, and with them fell the greatness of the house of Neville. This fatal battle, followed by the decisive engagement of Tewkesbury, completed the defeat of the Lancastrians, and concluded the sanguinary war of the roses. It appears (Penn's *Letters*) that every individual of two generations of the great families of Warwick and Somerset fell on the field or on the scaffold, a victim of these sanguinary contests. Warwick is the most conspicuous personage of these disturbed times. He kept open house wherever he resided, and daily fed at his various mansions 30,000. He loved turbulence for its own sake, and was ready to make or unmake any king, according to the caprice of the moment, and in order to show his power.

WARWICK, ROBERT RICH, Earl of, about 1590-1658; succeeded to the title, 1618, and was a descendant of lord-chancellor Rich. He joined himself to the Puritan movement, took great interest in the colonization of Rhode Island, and was a friend of Thomas Hooker, founder of Wethersfield. In the war of the rebellion he was a supporter of the Puritan cause, in 1642 served under Northumberland as lieutenant of the fleet, and during the protectorship of Cromwell was chosen to bear the sword of state in the latter's presence.

WARWICKSHIRE, one of the midland counties of England, bounded on the w. by Worcestershire, on the n. by Stafford and Leicester shires, and on the s. mainly by that of Oxford. Area, 610,587 acres; pop. '71, 630,472. The surface, though presenting no lofty hills, is marked by gentle eminences and vales. The n. districts of the county were formerly occupied by the forest of Arden, of which there are still remains; and the scenery, in general remarkably rich and charming, is varied by moor and heath. The principal rivers are the Avon, flowing from the n.e. to s.w.; and the Tame in the north. The soil varies much in quality, being cold and heavy on the higher and more exposed positions; while in more favorable districts, it is as a rule good. Of the whole area, there were (1878) 488,819 acres under all kinds of crops. The chief manufacturing centers in Warwickshire are Birmingham and Coventry; the brass jewelry, iron, and steel-pen trades are carried on in the former, and ribbon-weaving and watchmaking in the latter. Of minerals, coal, stone, lime, and marl are found. The county returns four members to the house of commons.

WASATCH, a co. in n.e. Utah, 9,500 sq.m.; pop. '80, 2,927—2,134 of American birth, 8 colored. In the n. portion are the Uintah mountains; the Wasatch mountains lie along the w. border, a long range extending from the n. border of Utah nearly to the Colorado river, the highest peaks of which are 11,500 ft. high, their sides broken by cañons varying in depth from 2,000 to 5,000 feet. The summits of this range rise from a plain varying from 4,250 to 6,000 ft. in height, and reach a further elevation of from 6,000 to 7,000 ft. above the valley. Silver is found. Co. seat, Heber.

WASCO, a co. in central Oregon, having the Columbia river on the n. and on the w. the Cascade range of mountains, including Diamond Peak, and the Blue mountains on the s.e., about 12,000 sq.m.; pop. '80, 11,120—8,417 of American birth, 1302 colored. Co. seat, Dalles.

WAS'ECA, a co. in s. Minnesota, 432 sq.m.; pop. '80, 12,385—8,694 of American birth, 9 colored. Co. seat, Waseca.

WASH. a wide estuary on the e. coast of England, between the counties of Lincoln on the n.w. and Norfolk on the s.e., is about 22 m. in length, and 15 m. in average breadth. It is surrounded by low and marshy shores, and receives the rivers Witham, Welland, Ouse, Nen, and Nar. The estuary for the most part is occupied by sandbanks, dry at low water, and between these sandbanks are the channels through which the rivers mentioned flow into the North sea. On both sides of the channel by which the Ouse falls into the sea, considerable tracts of land have been reclaimed. Anchorage is afforded to vessels by two wide spaces or pools of water, called respectively Lynn deeps, opposite the coast of Norfolk, and Boston deeps, opposite the Lincolnshire coast.

WASHBURN, CADWALLADER COLDEN, LL.D., b. Maine, 1818; brother of Elihu B. and Israel, jr. He removed to the west in 1839, and lived in Illinois and Wisconsin. He was elected to congress in 1856 and served three terms. He was a delegate to the peace conference of 1861, but soon after raised and became col. of a cavalry regiment, commanded an expedition into Mississippi, and later was at the head of divisions in the Vicksburg campaigns, held a command under gen. Banks in Louisiana, and reached the rank of maj. gen. of volunteers. From 1867 to 1871 he was again a member of congress, and in the latter year was elected governor of Wisconsin by the republican party of that state. He is largely engaged in the manufacture of lumber and flour in Wisconsin and Minnesota.

WASHBURN, CHARLES AMES, b. Maine, 1822; educated at Bowdoin college. He went to California in 1850, became editor and afterward proprietor of the *Alta California*. He was editor and proprietor of the *San Francisco Times*, 1858-61. He acted with the republican party from its foundation, was a presidential elector in 1860, and was minister to Paraguay, 1861-68. Violence was offered to his legation by Lopez, and Washburn saved them only by calling the aid of an American squadron.

WASHBURN, EDWARD ABIEL, D.D., 1819-81; b. Boston; graduated, Harvard college, 1838; studied theology at Andover seminary, and at the divinity school of Yale college, graduating 1842; was licensed as a Congregational minister, but after preaching six months entered the Episcopal church, and was ordained by bishop Eastburn, 1844; was rector of St. Paul's, Newburyport, Mass., for seven years; spent six months in China, 1851, returning through India, Egypt, Palestine, and Europe, 1853; became rector of St. John's church, Hartford, and prof. of church polity at the divinity school, Middletown; rector of St. Mark's church, Philadelphia, 1862; of Calvary church, New York, 1865; visited Europe, 1871, as a delegate of the evangelical alliance. Dr. Washburn was a member of the committee on Bible revision, a translator of part of Lange's commentaries, a contributor to reviews and other periodicals, an eloquent speaker, and a broad churchman in his views, fraternizing cordially with ministers and Christians of other denominations. His intellectual power was great, and he was admired equally for a certain symmetry and nobleness of character.

WASHBURN, EMORY, LL.D., 1800-77; b. Mass.; graduated at Williams college in 1817. He was admitted to the bar in 1821, and practiced his profession at Worcester, 1828-56, attaining a high rank. He was a justice of the court of common pleas, 1844-47, and governor of Massachusetts, 1854-55. He had previously served in both branches of the state legislature, and had declined a whig nomination for congress, though in a district surely whig. The overthrow of the whigs in Massachusetts by the "know-nothings" cut short his political career. He afterward acted with the republican party, and was in the Massachusetts legislature as chairman of the judiciary committee the last year of his life. He was prof. in the Harvard law school, 1855-76. His most important works are *Treatise on the American Law of Real Property* (1860-62) and *Law of Easements and Servitudes* (1863).

WASHBURN, ISRAEL, 1784-1876; b. Mass.; in 1806 went to Maine, and two years later became a shipbuilder on the Kennebec river, near the site of Richmond. He afterward settled in Livermore, Maine. He was the father of Samuel Benjamin, William Drew, Elihu Benjamin, Cadwallader Colden, Charles A., and Israel, jr.

WASHBURN, ISRAEL, JR., LL.D., b. Maine; called to the bar in 1834. He continued to practice his profession with success till 1850, when he was elected to congress; and he was four times re-elected. He was governor of Maine, 1861-62, and in 1863 was appointed collector of Portland. He is now (1881), collector of internal revenue.

WASHBURN, WILLIAM BURRITT, LL.D., b. Mass., 1820; graduated at Yale college, 1844. He became a manufacturer in Greenfield, Mass., where he has since resided. He was a member of the Massachusetts senate in 1850, and of the house in 1854. In 1863 he was unanimously elected to congress on the republican ticket, and was four

times re-elected. He was governor of Massachusetts, 1871-74, when he resigned, having been elected to fill the remainder of Charles Sumner's term in the U.S. senate. His term expired in 1875.

WASHBURN, ELIHU BENJAMIN, b. Livermore, Me., 1816; as a boy was apprenticed in the Kennebec *Journal* office; studied law at the Harvard law school; was admitted to the bar, and in 1842 began practice at Galena, Ill., where he became acquainted with gen. Grant. He was sent to congress as a whig in 1853, and held his seat until 1869, joining the republican party not long after its organization. In 1869 he was appointed secretary of state by president Grant, but resigned on account of ill-health, and was appointed minister to France, a position which he held until 1877, when he was recalled at his own request. In the Franco-Prussian war he was requested by the German government to act as its representative in France. He remained in Paris during the siege and the rule of the commune, and his energetic and impartial aid to foreign citizens and to suffering Parisians were recognized by the governments of France and Germany as well as by that of the United States.

WASHING AND WASHING MACHINES. Although domestic washing is a simple enough process, yet it may be useful to give a brief description of the most efficient way of conducting it, in so far as experience and correct principles can guide such an operation. The first essential is suitable water, in other words, *soft* water. See **WATER-SUPPLY**. Yellow soap (q.v.) being the kind chiefly used in washing linen, it is well to bear in mind that it is not desirable to purchase it very pale in color, or very low in price. In order to gratify the desire for a light color soap-makers are obliged to reduce the strength of good dark soaps with adulterants; and it will give some idea of how easily the demand for cheapness may be met to state that hard soap which should not contain so much as 25 per cent of water, can be made with as much as 75 per cent. Soap, as is well known, improves by keeping. Soft or potash soap is sometimes used to wash coarse things, on account of its being stronger than hard soap, but its smell is objectionable. Soda is easily procured good; and with respect to washing-powders, as their merit depends on the amount of alkali which they contain, suffice it to say that to buy them is only a dear way of buying soda.

In arranging clothes for washing, it is desirable to sort them into kinds most suitable for washing together; such as lace, nets, and fine muslin into one heap; white body-linen into another; colored things of the nature of prints and gingham into another; and so on. It is also desirable to wash clothes as soon as possible after they are soiled. Previous to washing, all white articles should be soaked for a night in cold water, in which a little soda has been dissolved, as the steeping in alkaline water greatly aids in removing all dirt of a greasy nature. The clothes should then be washed twice in clean tepid water with a sufficient supply of soap. If the water is quite cold, the dirt is taken off with difficulty; and if too hot, it is apt to fix it into the fiber of the cloth. The clothes should next be examined for spots or stains, so as to remove them, if possible, by an additional rubbing; after which they are boiled for at least 15 minutes in soap and water. Ink-stains or iron-molds require to be taken out with oxalic acid, or the essential salts of lemon (oxalate of potash); and fruit-stains by boiling the stained part with pearl-ash. After being boiled, the clothes are rinsed twice in cold water; and in the second rinsing, a little stone blue is added, to neutralize any yellowness occasioned by the washing. When this is done, they are wrung, and hung out to dry.

For the washing of flannels, it is even more desirable that the water should be softer than for linen or cotton; and it should contain no soda or potash in any form, as although a little alkali would more effectually remove dirt, yet it always turns woollens yellow, and at the same time thickens them. It is well to remember also that all rubbing, wringing, or squeezing tends to make woollen goods shrink, by facilitating their tendency to felt or mat into a thicker fabric. With respect to ladies' colored dresses made of fine wool, such as merino, it is considered best to wash them in warm soft water with ox-gall, say a pint in a tubful of water. Ox-gall is a soap in its chemical nature, and it clears and brightens the colors.

The washing of printed cotton fabrics, especially muslins, has of late years become a difficult operation, on account of the fugitive nature of some of the dye-stuffs employed. The beautiful hues produced by the aniline or coal-tar colors, and by the archil lakes in imitation of them, have led to their being extensively used in calico-printing, as well as in the dyeing of silk and wool. These dyes can scarcely be said to be permanent on any fabric; but on cotton they require to be fixed by mordants, such as albumen (white of egg), which will scarcely stand washing at all, and to which hot water is utter destruction. The same thing is true of some other dyes, such as the light blue produced by artificial ultramarine. If economy is to be studied, it is far better to have printed dresses done in fast colors—the reds and purples, from madder, for example—as they, although less attractive at first, can be washed without injuring their appearance. All such articles should be washed in soft warm water; that which has been used for flannels, if not too dirty, will do. When thoroughly cleaned, rinse them well in clean cold water, and do not allow them to remain long in contact before they are hung up to dry.

White silk articles, as stockings and gloves, should be washed with soap, first in

mlrk warm, and afterward in nearly boiling water. They will be improved if hung up for a short time in the fumes of burning sulphur (sulphurous acid) while still damp.

We have now to notice the domestic washing-machines which have, of late years, come into rather extensive use. A machine of this kind, when in motion, ought to produce at least as much agitation as will keep up a constant change in the deterging solution in contact with the linen, and at the same time cause the clothes to slide over each other in a somewhat analogous manner to hand-washing. There is an old form of washing-machine called the *dolly-tub*, which has been in use in Yorkshire for upward of eighty years. It consists essentially of a presser or dolly, which is simply a round piece of wood, say ten inches in diameter, with from three to five legs rounded at the ends; the whole exactly resembling a footstool, but with the addition of an upright rod or spindle from its center, with a cross piece at the top for working it. Any vessel, such as a tub, barrel, or box, may be used to hold the clothes, which are washed by moving the dolly first one way and then the other, at the same time a certain pressure being exerted on them against the sides and bottom of the vessel.

Of recent washing-machines a certain class of them are modifications of the dolly-machine, with spring-ribbed boards, on which the linen is rubbed by a swinging motion. Another class consists of boxes which also oscillate upon an axis, but operate by jerking the clothes and water from side to side. A third, and perhaps the most efficient class, are made upon the principle of the dash-wheel, so much used in large bleach-works. In this machine, the materials to be washed are lifted by internal ribs on the rim of a large wheel, and allowed to fall with some force from fully half its height into the cleansing liquid—this being of course repeated as the wheel rotates.

In a dash-wheel washing-machine for domestic purposes, by Messrs. Summercales & Sons, Kreighley, Yorkshire, the linen is put inside the drum or dash-wheel (a sparrd cylinder), which has a reciprocating action, so that, after making a complete revolution, it is reversed. The clothes are thus driven both ways through the water, and the quick reversing action of the machine gives them a jerk or dash at each change of motion—the equivalent of the fall from a large dash-wheel. There are brushes on the inside of the drum, which are brought into play if the clothes are coarse and dirty, but are turned out of action if they are of a fine description. A machine of this kind, 26 in. wide, will take in 2 pair of sheets or a dozen of shirts at a time, and by turning the handle with a brisk motion, they will be washed in 8 or 10 minutes. The lather for linen is made up with one pound of soap, half a pound of soda, and three quarts of water—the last being poured in boiling. Only about half as much soap is required as for washing by hand.

The wringing is performed by passing the wet clothes through wooden rollers, the upper one being temporarily covered with flannel to protect buttons, hooks and eyes, etc., from damage. The necessary pressure is obtained by a means of a spring, and before turning the rollers, the washing-cylinder is thrown out of gear. With the aid of mangling-boards the clothes are mangled by these same rollers.

Washing by steam, though little known in England, is practiced to a considerable extent in France. The French chemist, Chaptal, first brought the process to perfection. Besides a saving of fuel, soap, and manual labor to the extent of at least one-half, the wear and tear of the linen attending rubbing and beating is avoided. The efficacy of steam in washing depends upon its penetrating and dissolving property. The clothes are first steeped in a ley of soda or potash, or in a mixture of alkali and soap, and then hung in a wooden vessel kept full of steam by a pipe communicating with a boiler. On a small scale, a large cask, made air-tight, will answer, and a common tea-kettle will produce steam enough. There must be an aperture to allow the air to escape when the steam first enters; the air being expelled, the aperture is shut. In half an hour the dirt is sufficiently loosened to wash out with ease, and the linen is found to be extremely white.

WASHING OF FEET (called in Latin *pedilavium*, and sometimes *mandatum*, from the first word of the "little chapter" in the service), one of the ceremonial observances of the holy week (q.v.) in the Roman Catholic church. It forms part of the service of holy Thursday, which day, from the word *mandatum*, is also called Maundy Thursday. The origin of this observance is extremely ancient. It is founded on the example and exhortation of our Lord in John xiii. 5-14; and is traceable in the writings of Justin, Tertullian, Ambrose, and Augustine, as well as in many of the early councils. In some churches, however, or at least at some particular periods, the day fixed for the ceremonial was good Friday, although for many centuries it has uniformly been assigned to holy Thursday. It is necessary, however, to distinguish from the ceremonial of the holy week, another washing of the feet (also called *pedilavium*), which, in the case of catechumens, preceded baptism, and which, in many churches, was accompanied by a washing of the head, *captilavium*, and took place on palm Sunday (q.v.), thence called "*Dominica Captilavii*." To this usage Sts. Ambrose and Augustine distinctly refer. In the mediæval and modern church, the washing of feet has generally followed the solemn mass of the day. In those churches where the ceremony is still retained, the officiating bishop or priest, wearing a cope and girt with a towel, and attended by a deacon and subdeacon, washes, dries, and kisses the right foot of a certain number of pilgrims, generally twelve, in memory of the twelve apostles; after which all the pilgrims are hospitably entertained, and served in

person by the bishop, who distributes to each a dole in money or provisions. An appropriate service, consisting of a gospel (John xiii. 1-14) sung by the deacon, a chapter ("Mandatum novum") chanted by the choir, and a prayer by the bishop, accompanies the ceremonial. The washing of the pilgrims' feet on holy Thursday forms a very striking part in the holy week ceremonial as carried out not only by the pope, but also by the bishops in most of the great cathedrals abroad. It was also practiced by kings and other royal and noble personages, even down to a very recent date.

WASHINGTON, a co. in s.w. Alabama, bounded on the e. by the Tombigbee river; about 1000 sq.m.; pop. '80, 4,538—4,526 of American birth, 1753 colored. Co. seat, St. Stephens.

WASHINGTON, a co. in n.w. Arkansas; containing a sandstone called millstone grit; 850 sq.m.; pop. '80, 23,844—23,700 of American birth, 1,109 colored. Co. seat, Fayetteville.

WASHINGTON, a co. in n.w. Florida, having the gulf of Mexico on its s. border; 1000 sq.m.; pop. '80, 4,089—4,067 of American birth, 918 colored. Co. seat, Vernon.

WASHINGTON, a co. in central Georgia; drained by the Ogeechee and other rivers; 900 sq.m.; pop. '80, 21,964—21,928 of American birth, 12,519 colored. Co. seat, Sandersville.

WASHINGTON, a co. in s. Illinois, bounded on the n. by Kaskaskia river; 550 sq.m.; pop. '80, 21,117—16,852 of American birth, 212 colored. Co. seat, Nashville.

WASHINGTON, a co. in s. Indiana, bounded on the n. by the Muscatatuck river; 530 sq.m.; pop. '80, 18,954—18,687 of American birth, 3 colored. Co. seat, Salem.

WASHINGTON, a co. in s.e. Iowa, bounded on the n.e. by the Iowa river; 575 sq.m.; pop. '80, 20,375—18,518 of American birth, 95 colored. Co. seat, Washington.

WASHINGTON, a co. in n. Kansas; 900 sq.m.; pop. '80, 14,910—12,422 of American birth, 19 colored. Co. seat, Washington.

WASHINGTON, a co. in central Kentucky; 370 sq.m.; pop. '80, 14,419—14,288 of American birth, 2,431 colored. Co. seat, Springfield.

WASHINGTON, a par. in e. Louisiana, bounded on the e. by the Pearl river; 600 sq.m.; pop. '80, 5,190—5,184 of American birth, 1175 colored. Co. seat, Franklinton.

WASHINGTON, a co. in s.e. Maine, having the Atlantic ocean on the s.; 2,950 sq.m.; pop. '80, 44,477—37,636 of American birth, 276 colored. Co. seat, Machias.

WASHINGTON, a co. in n. Maryland, bounded on the n.w. by the Potomac river, drained by the Antietam and other rivers, having the Blue Ridge or South mountain on its e. border; 450 sq.m.; pop. '80, 38,561—37,942 of American birth, 3,064 colored. Co. seat, Hagerstown.

WASHINGTON, a co. in e. Minnesota, having the Mississippi river for its s. boundary; 375 sq.m.; pop. '80, 19,562—11,889 of American birth, 63 colored. Co. seat, Stillwater.

WASHINGTON, a co. in w. Mississippi, having the Mississippi river for its w. boundary separating it from Arkansas; partly subject to inundation; about 1000 sq.m.; pop. '80, 25,365—25,001 of American birth, 21,891 colored. Co. seat, Greenville.

WASHINGTON, a co. in s.e. Missouri, hilly, well-timbered, and containing vast mineral resources; 750 sq.m.; pop. '80, 12,895—12,478 of American birth, 1038 colored. Co. seat, Potosi.

WASHINGTON, a co. in e. Nebraska, having the Missouri river for its e. boundary, consisting of fertile prairies well watered; 400 sq.m.; pop. '80, 8,631—6,861 of American birth, 20 colored. Co. seat, Blair.

WASHINGTON, a co. in e. New York, having lake George for its n.w. boundary, lake Champlain on the e., and the Hudson river on the w.; 870 sq.m.; pop. '80, 47,874—41,525 of American birth, 355 colored. Co. seats, Salem and Sandy Hill.

WASHINGTON, a co. in e. North Carolina, bounded on the n. by Albemarle sound, having the mouth of the Roanoke river on the n.w. margin; 400 sq.m.; pop. '80, 8,928—8,910 of American birth, 4,377 colored. Co. seat, Plymouth.

WASHINGTON, a co. in s.e. Ohio, bounded on the s. and s.e. by the Ohio river, containing valuable petroleum wells; 650 sq.m.; pop. '80, 43,244—40,191 of American birth. Co. seat, Marietta.

WASHINGTON, a co. in n.w. Oregon, bounded on the n.w. by the Coast range; 850 sq.m.; pop. '80, 7,082—5,902 of American birth, 117 colored. Co. seat, Hillsborough.

WASHINGTON, a co. in s.w. Pennsylvania, bounded on the e. by the Monongahela river, produced in one year 1,862,752 lbs. of wool; value of the coal mined in one year, \$596,080; 900 sq.m.; pop. '80, 55,417—52,190 of American birth; 2,645 colored. Co. seat, Washington.

WASHINGTON, a co. in s. Rhode Island, having the Narragansett bay for its e. boundary, on the s. the Atlantic ocean; 370 sq.m.; pop. '80, 22,495—20,100 of American birth, 780 colored. It has extensive woolen manufactures. Co. seat, Kingston.

WASHINGTON, a co. in e. Tennessee; 600 sq.m.; pop. '80, 16,151—16,162 of American birth, 1578 colored. Co. seat, Jonesborough.

WASHINGTON, a co. in s.e. Texas, produced in one year 22,452 bales of cotton; 600 sq.m.; pop. '80, 27,584—24,498 of American birth, 14,729 colored. Co. seat, Brenham.

WASHINGTON, a co. in s.w. Utah; 1500 sq.m.; pop. '80, 4,225—3,265 of American birth, 79 colored. Co. seat, St. George.

WASHINGTON, a co. in n. Vermont, containing a part of the Green mountains and Camel's Hump, a peak rising 4,088 ft. above the level of the sea; 640 sq.m.; pop. '80, 25,403—23,485 of American birth, 35 colored. Among its mineral products are verd-antique marble, dolomite, serpentine, slate, and granite. Co. seat, Montpelier, the capital of the state.

WASHINGTON, a co. in s.w. Virginia, bounded on the n.w. by Clinch mountain, contains a long ridge called Walker's mountain; 550 sq.m.; pop. '80, 25,303—25,155 of American birth, 4,090 colored. It has extensive beds of solid salt. Co. seat, Abingdon.

WASHINGTON, a co. in s.e. Wisconsin, drained by the Milwaukee, Mequon, and Rubicon rivers; 432 sq.m.; pop. '80, 23,442—15,903 of American birth, 2 colored. Co. seat, West Bend.

WASHINGTON, D. C., the seat of the government of the U. S. of America, is in the district of Columbia, on the left bank of the Potomac river, between Anacostia river and Rock creek, which separates it from Georgetown; lat. 38° 51' 20" n., long. 77° 0' 15" w.; 35 m. s.w. of Baltimore, 136 from Philadelphia, 205 from New York, 120 n.e. of Richmond, 1203 from New Orleans, 2,000 from San Francisco, 160 above the mouth of the Potomac, and 300 from the capes of the Chesapeake. The Potomac at Washington is one m. wide, and of sufficient depth for the largest vessels. The city was laid out under the direction of gen. Washington, on a handsome scale for the national capital, on a plateau 40 ft. above the river, with several elevations, with streets from 90 to 120 feet wide, and 20 avenues 130 to 160 feet. The principal edifices are the capitol; the white house, residence of the president; patent office; general post-office; treasury, war, and navy departments; Smithsonian institute (q.v.), etc. The capitol, on the summit of a gentle elevation, in a pleasure-ground of 35 acres, was commenced in 1793, burned by British troops in 1814, completed in 1825, and extended by the addition of two spacious wings in 1851; the center is 352 ft. by 101, with a lofty dome; the wings 142 by 235 ft.; the entire building being 751 ft. long, 324 deep, covering 3½ acres—the center of white sand-stone, the wings white marble. The rotunda, under the dome, contains several national pictures by Trumbull, Weir, Vanderlyn, Powell, Chapman, etc. The senate chamber is a noble hall, 112 by 82 ft., with galleries for 1000 spectators; the hall of representatives is 139 by 93 ft.; with galleries for 1200. The old senate and representative chambers, used before the enlargement, are beautiful rooms. The congressional library, 91 by 34 ft., contained in 1876 upward of 300,000 volumes. The capitol, containing also numerous committee rooms and offices, is highly ornamented with rich marbles, frescoes, and groups of statuary. The buildings of the treasury and state departments, post-office, etc., are massive and spacious. The saloons of the patent office, filled with models, are 1300 ft. in length. A monument to Washington intended to be 600 ft. high remains unfinished. The city also contains numerous large hotels, 50 churches, a Roman Catholic and a Baptist college, three daily and several weekly newspapers, academies, schools, etc. The public buildings alone, however, are spacious and costly, the city in general having a scattered and mean appearance. During the war of secession, from its exposed position, it was threatened with capture, and was surrounded by fortifications, and converted into an intrenched camp. Pop. in '78, 131,947.

WASHINGTON, D. C. (*ante*), was built on the Potomac, as a compromise after a long conflict in congress over the claims of rival places. In accordance with the act of March 30, 1791, the boundaries of the city and the location of the public squares and buildings were determined by president Washington himself, who thus, at the height of his fame, availed himself of the skill in surveying that he had acquired in his youth. He called it the Federal city, but after his death it received his name. The topographical plan is a monument of French influence which at the time was so strong; a French engineer, under the direction of Washington and Jefferson, having taken as a basis for his plan Versailles, the seat of the government of France. Thus it happened, at a time when the words "French revolution" were unknown, that the broad avenues crossing in various directions rectangular streets, with the resulting squares, circles, and triangles, which marked the residence of a splendid monarchy, were perpetuated in the capital of the great republic of the west. The streets from n. to s. are numbered; those from e. to w. are lettered; and crossing these in different directions are 21 avenues, named after various states, and the newly laid out Executive avenue winding from the president's house around the city to the capitol. The streets and avenues are from 70 to 160 ft. wide, and their aggregate length is more than 250 miles. As the plan was so extensive and the actual growth for many years was very small, Washington was often satirically called "the city of magnificent distances." In 1800 it was said, "The capitol is on an eminence near the center of the immense country called here 'the city.' There is one

good tavern and several other houses are finished or being built." Pennsylvania avenue was then a deep morass covered with bushes. For years members of congress lived principally in Georgetown. As a higher price was asked for land around the capitol, the most commanding and healthful portion of the city remained unoccupied for more than 50 years. The stores and dwellings advanced toward the n. w. along Pennsylvania avenue. In 1839 an English traveler said, "The town looks like a large straggling village reared in a drained swamp." In 1851 the work of laying out and adorning the reservations and parks was commenced under the skillful guidance of A. J. Downing, but his death, the next year, and the neglect of congress arrested it for 20 years. In 1871 came a new era. A government for the district was established by congress with a governor and legislature and a board of public works, to which was given control of the streets, avenues, and sewers of Washington and Georgetown, with authority to improve them under a general plan. A system of sewerage and of pavements was organized which resulted in regrading most of the highways, paving 160 m. of streets with stone, wood, or concrete, planting about 30,000 shade trees, and improving the public squares with fences and trees. In three years the city was transformed. From that time to the present a very large number of public buildings and private residences has been erected. The city covers about 6,000 acres, of which the government reservations comprise 500, and the streets 2,500, leaving 3,000 for the lots on which private residences are built. Half of the ground therefore is not built upon; and as the open places are in all parts of the city, fresh air is abundant and healthfulness is greatly promoted. The undulating surface of the city produces a constant variety of scenery without obstructing the travel. Its environs present a beautiful and picturesque landscape, which is seen to the best advantage from the portico or the dome of the capitol, and drew from Humboldt the declaration, "In all my travels I have not seen a more charming panorama."

The capitol building is the most conspicuous object; its white dome being visible from all directions for miles around. Its lofty position, massiveness, and harmonious effect have elicited a general verdict from good judges of all lands that it is one of the most impressive edifices of modern times. The central building was designed chiefly by B. H. Latrobe, and the extension with the dome by Thomas U. Walter. The new hall of representatives was occupied in 1857, and the senate chamber in 1859. During the war of the rebellion the work was carried on; the great dome rose from day to day while the city was an intrenched camp, and at the close of 1863 the statue of freedom was lifted to its place. The rotunda is 96 ft. in diameter and 180 in height. The senate chamber, in the center of the n. wing, is plainly finished, but the corridors and committee rooms are elaborately adorned. The marble stairway is a gem of architecture; the long apartment in the rear is constructed of the richest varieties of marble; and near at hand are the splendid room for the president and the plainer one for the vice-president. The s. wing contains the hall for the house of representatives, which is said to be the largest legislative chamber in the world. The old senate chamber now accommodates the supreme court, and the old hall of the house—not surpassed in beauty by any room in the building—contains statues of distinguished men of the several states. The library of congress, in the western projection of the central building, comprises three communicating and thoroughly fire-proof halls. As a copy of every publication for which a copyright is taken out must be sent to it, the number of volumes increases rapidly—far more rapidly than the accommodation; and a new library is now a necessity. The president's house, in the western part of the city, is 170 ft. long, 86 ft. deep, with a portico of 8 Ionic columns on the n. and a semicircular Ionic colonnade on the south. It is built of freestone, and after it had been burned by British troops in 1814, its blackened walls were painted white; hence it is popularly known as "the white house." The largest apartment—the e. room—is 80 ft. by 40, and 22 ft. high. Other beautiful rooms are named from the color of their respective decorations and furniture, in blue, green, and red. Though large sums have been expended in adorning this house for the executive head of the nation, its situation on low and marshy grounds, with other causes, renders it unhealthy, and a new residence on a more elevated site will probably be provided. Twenty acres of the grounds around it are inclosed and handsomely laid out. On the e. of the president's house is the massive treasury building, of freestone and granite, 468 ft. by 261, with Ionic porticoes on all the four sides, the monolithic columns on the s. front being 31½ ft. high and 4½ ft. in diameter; and on the w., the magnificent building for the state, war, and navy departments, of granite, in the Roman-Doric style, 567 ft. by 342, with four façades of which those on the n. and s., and on the e. and w. respectively correspond. The department of the interior has a grand Doric building—commonly known as the patent office—of marble, freestone, and granite, 453 ft. by 231. The general post-office building is of marble, in the pure Corinthian style, 300 ft. by 204. The Smithsonian institution, one of the greatest adornments of the city, is fully noticed elsewhere. The department of agriculture occupies a building of brick and brown stone, in the Renaissance style, 170 ft. by 61, with green houses, graperies, and experimental grounds, around it, covering 10 acres. The business of the department is the distribution over the country of seeds, plants, and general agricultural information. The U. S. naval observatory is on the Potomac between Washington and Georgetown. The grounds attached to it are 19 acres in extent. From the flagstaff on the dome of the principal building a signal ball is dropped daily at noon, transmitting by telegraphic connections the mean

time to all parts of the United States. Another edifice has been specially adapted to the reception and employment of the great equatorial telescope made by Alvan Clark, and mounted in 1873. It has an object-glass of 26 in. and cost nearly \$50,000. The army medical museum contains 10,000 MS. vols. of hospital reports and a large assemblage of specimens representing the effects of wounds, diseases, and surgical operations. The microscopic section is admirable; and the models of barracks, hospitals, ambulances, and surgical instruments are not equaled in any similar collection. The medical library contains about 40,000 volumes. The government printing and binding establishment, in a building 300 ft. by 175, has a complete equipment, and manufactures about 1,000,000 volumes annually. The navy-yard, about a m. s.e. of the capitol, covers about 27 acres, and though not much used for the construction of vessels, is of great importance in manufacturing and storing supplies. Besides the public buildings already erected, others in different parts of the city are rented for the department of justice, pension office, commissary bureau, and other branches of service.

Numerous attempts have been made with various degrees of success to adorn the city by the sculptor's art. There are equestrian statues of Washington, Jackson, Scott, Lincoln, and some other distinguished men. The Corcoran gallery of art, founded by the eminent banker whose name it bears, contains also his collection of paintings, statuary, and other works of art. The national monument to Washington was commenced in 1848, and after long delay is now to be completed as a lofty and plain obelisk, 70 ft. square at the base and 470 ft. high.

The soldiers' home, a national institution for invalid soldiers of the regular army, 3 m. n. of the city, was established in 1851, by the purchase of 200 acres with money levied by gen. Scott on the city of Mexico. It has since been greatly enlarged, and is maintained with a fund accumulated by retaining 12½ cents a month from the pay of each private soldier. The buildings are handsome, and the grounds, adorned with meadows, groves, and lakes, contain 7 m. of beautiful drives and supply a free public park for the city. Here also the presidents of the United States sometimes find a pleasant summer retreat. The naval hospital supplies a similar home for sick and disabled seamen of the navy. The Columbia institute for the deaf and dumb, at Kendall green, accommodates 100 pupils in beautiful buildings, surrounded with 100 acres; the hospital of the insane has a commodious building in the midst of 400 acres, and shelters 600 patients; Providence hospital has 200 inmates; the Louise home is a beautiful building, on the finest avenue of the city, erected and endowed by Mr. Corcoran as a memorial of his daughter and a home for gentlewomen who have become poor. The Columbia woman's hospital, the Washington orphan asylum, soldiers' and sailors' orphans' home, St. Joseph's and St. Vincent's orphan asylums, St. John's hospital for children, the freedmen's hospital, and the home for the aged under the care of "the little sisters of the poor," are among the charitable institutions with which the city abounds. Among its institutions of learning are Columbian university; Gonzaga college, under Jesuit instruction; and Howard university, for colored youth, under Congregational and Presbyterian supervision.

The great interests centering in the legislation for nearly 50,000,000 of people—embracing 38 states and 9 territories—bring to the city multitudes of people of every class and for various objects; and its pleasant winter climate makes it attractive to persons of wealth and leisure from all parts of the country, and to visitors from other lands. The fashionable season begins with the meeting of congress in December. From Christmas to Lent, receptions, balls, and dinners abound; the levees of the president, members of the cabinet, and speaker of the house are open to all comers; the president receives the calls of the public from 12 to 3 p.m. on four days of the week; and on Jan. 1 his reception is attended by foreign ministers in official costume, officers of the army and navy in uniform, officers of the government, members of congress, and citizens generally.

There are 120 church edifices representing 15 different denominations. The principal parts of the city and of Georgetown are well supplied with street-cars. Among the places of amusement are Ford's opera-house and the National theater. Some of the public halls are Lincoln, Odd Fellows', Willard's, Tallmadge, and the Masonic temple; and of the hotels, the Arlington, Ebbitt house, Willard's, Riggs house, National, and Metropolitan are widely known. Owing to the peculiar character of the population, boarding-houses greatly abound. The number of government officers and clerks is about 5,000. During the rebellion Washington was the center of vast military operations. Its fortifications "consisted of 68 inclosed forts and batteries, having an aggregate perimeter of about 14 m., and emplacements for 1120 guns, of which 807, besides 98 mortars, were mounted; of 93 unarmed batteries having 401 emplacements; and of 20 m. of infantry trenches. The entire circuit of the line, exclusive of the chain bridge-works, and of the stretch across the Potomac from fort Greble to fort Lyon, was 33 m.; 32 m. of military roads, besides the existing streets and avenues of the district, afforded the means of communication." These works were serviceable for the safety of the city after the disasters of 1862 and when Early marched on the city. Throughout the war Washington was a vast depot for military supplies; long trains of army-wagons were almost constantly passing through its streets; immense hospitals for the sick and wounded were erected, and many churches, public institutions, and the capitol itself were at times given up to this service. During these critical years property greatly depreciated and no new build-

ings were erected. But at the return of peace the rapid building up of the new Washington already described began.

Favorite drives out of the city take visitors to the soldiers' home with its enchanting view; to Rock Creek valley, rich in flowers and forest trees; to the heights above Georgetown, with its wide and impressive prospect, and to Arlington heights on the Virginia shore, with its city of the dead containing 15,000 union soldiers' graves, and its view across the Potomac bounded by the dome of the capitol.

WASHINGTON, a city in s.w. Indiana, co. seat of Daviess co.; pop. '80, 4,323. It is 19 m. e. of Vincennes, 3 m. e. of the west fork of White river, in the vicinity of rich coal mines; having 7 establishments. It contains a court-house, 2 banks (1 national), and 3 newspapers. It is the center of an important trade in grain and cattle, and has manufactures of flour and woolen goods.

WASHINGTON, a city in s.e. Iowa, settled 1835; co. seat of Washington co.; pop. '80, 2,950. It is the e. terminus of the Sigourney branch of the Chicago, Rock Island, and Pacific railroad, 28 m. n.e. of Fairfield. It is the center of a fertile farming district, and has 12 churches, an academy, 2 national banks, 3 newspapers, 2 steam elevators, and manufactures of woolen goods, flour, and agricultural implements.

WASHINGTON, a t. in s.e. Missouri, co. of Franklin, 55 m. by rail from St. Louis; pop. '80, 2,421. It is built on a high ridge on the s. bank of the Missouri river, and is intersected by the Missouri Pacific railroad, a steam ferry connecting the town with the opposite bank. It is in the center of a fertile agricultural region, a shipping point for produce and the fire and potter's clay found in great abundance in the vicinity and shipped to St. Louis. It contains a savings bank, 7 churches, a Turnverein hall, public schools, a convent, a Catholic parochial school, a free Lutheran school, the Jeffries high school, and 2 newspapers. Its industries include flour, leather, and pork packing.

WASHINGTON, the seat of Washington co., Penn.; contains a court-house, 9 churches, several banks, a female seminary, and Washington and Jefferson college, formed in 1865 by the union of Jefferson college, which had been chartered, 1802, at Canonsburg, 7 miles distant, with the college established at Washington in 1806. The union of these adjacent institutions, several times previously attempted, became after the war a matter of necessity to both; and rev. Dr Beatty, of Steubenville, Ohio, having offered \$50,000 toward an endowment for the united college, the legislature, in 1865, authorized the union with the understanding that parts of the course of study should be pursued at Canonsburg and parts at Washington. But as this partial union proved unsatisfactory, the legislature subsequently gave authority to consolidate the whole at Washington. Its endowment now is sufficient for 9 professors, and its new buildings accommodate all the departments.

WASHINGTON, BUSHROD, LL.D., 1759-1829; b. Virginia; nephew of George Washington, being the son of John Augustine Washington, younger brother of the latter. From 1780 to 1781 he was a volunteer member of col. Mercer's troop of horse. After the war he went to Philadelphia, where he devoted himself to the study of law, and returning to Virginia, practiced in his native county. He was elected a member of the Virginia house of delegates; and was also a member of the Virginia state convention which ratified the constitution of the United States in 1788. He was appointed in 1798, by president Adams, one of the judges of the supreme court of the United States. On the death of gen. Washington, he left Mount Vernon to his nephew Bushrod.

WASHINGTON, GEORGE, commander-in-chief of the continental forces in the war of the American revolution, and first president of the United States, was b. in Westmoreland co., Va., Feb. 22, 1732; son of Augustine Washington and his second wife, Mary Ball; a descendant of John Washington, who emigrated to Virginia from England about 1657, who was a grandson of John Washington, mayor of Northampton, and first lay-proprietor of the manor of Sulgrave, in Northamptonshire, who married a daughter of Shirley, earl Ferrers. Lawrence, an elder brother of John, studied at Oxford; John resided at one time at South Cave, Yorkshire. Being royalists in the time of Cromwell, both emigrated, and became landed proprietors and planters in Virginia, in the district between the Potomac and Rappahannock rivers. Augustine Washington died when his second son George was 12 years old, leaving a large property to his widow and five children. His education in the indifferent local schools extended only to reading, writing, arithmetic, book-keeping, and land-surveying, then an important acquisition. He grew tall, had great physical strength, and was fond of military and athletic exercises. At the age of 13 he wrote out, for his own use, 110 maxims of civility and good behavior. In 1749 his elder brother, capt. Lawrence Washington, served under admiral Vernon in the expedition against Carthagenia, and named his residence on the Potomac Mount Vernon, in honor of his commander, who offered George a commission as midshipman on his ship, which, but for the opposition of his mother, he would have gladly accepted. He then spent his time chiefly with his brother at Mount Vernon, and with lord Fairfax, who owned great estates in the Virginia valley; and in 1748 he engaged to survey these wild territories for a doubloon a day, camping out for months in the forest, in peril from Indians and squatters. At the age of 19, at the beginning of the seven years' war, he

was appointed adjutant of the provincial troops, with the rank of maj.; in 1751 he made his only sea voyage—a trip to Barbadoes—with his brother Lawrence, who died soon after, and left George heir to his estates at Mount Vernon. At 22 (1754) he commanded a regiment against the French, who had established themselves at fort Duquesne (now Pittsburg), and held fort Necessity against superior numbers, until compelled to capitulate. The year following, when two regiments of regulars were led against fort Duquesne by gen. Braddock, Washington volunteered; and at the disastrous ambuscade of July 9, 1755, he was the only aid not killed or wounded. He had four bullets through his coat, and two horses were shot under him. The Indians believed that he bore a charmed life, and his countrymen were proud of his courage and conduct. Two thousand men were raised, and he was selected to command them. In 1759 he married Mrs. Martha Custis, a wealthy widow, resigned his military appointments, and engaged in the improvement of his estates, raising wheat and tobacco, and carrying on brick-yards and fisheries. He was, like nearly all Americans of property at that period, a slaveholder, and possessed at his death 124 slaves, whom he directed, in his will, to be emancipated at the death of his wife (who survived him but three years), so that the negroes of the two estates, who had intermarried, might not be separated. He was for some years a member of the Virginia assembly; and in 1774, though opposed to the idea of independence, and in favor of the union with Great Britain so ardently desired by all British Americans, he was ready to fight, if necessary, for the constitutional rights of the colonists. He spoke seldom and briefly; but Patrick Henry declared him to be, “for solid information and sound judgment, unquestionably the greatest man in the assembly.” The news of the battle of Lexington (April 19, 1775) called the country to arms; and Washington, then a member of the continental congress, was elected commander-in-chief by that body. He hastened to the camp at Cambridge; compelled the evacuation of Boston; was driven from New York; compelled to retreat across New Jersey; often defeated and reduced to the most desperate straits, by disaffection, lack of men and supplies, and even cabals against his authority; but by his calm courage, prudence, firmness, and perseverance, he brought the war, with the aid of powerful allies, to a successful termination; and (Dec. 23, 1783), the independence of the thirteen colonies achieved, he retired from the army to Mount Vernon, which he had, during the eight years of the war, but once visited. He refused pay, but kept a minute account of his personal expenses, which were reimbursed by congress. In 1784 he crossed the Alleghanies to see his lands in western Virginia, and planned the James river and Potomac canals. The shares voted him by the state he gave to endow Washington college, at Lexington, Va., and for a university. The federation of states having failed to give an efficient government, Washington proposed conventions for commercial purposes, which led to the convention of 1787, of which he was a member, which formed the present federal constitution, considered by him as the only alternative to anarchy and civil war. Under this constitution he was chosen president, and inaugurated at New York, April 30, 1789. With “Lady Washington,” so termed by the courtesy of the period, he presided over a federal court, far more formal and elegant than exists at this day, and made triumphal progresses in the north and south. During his second term of office, he was disgusted by the opposition of the republican party, under the leadership of Jefferson and Randolph, and refusing a third election, he issued, in 1796, his farewell address, and retired to Mount Vernon. In 1797, when there arose a difficulty with France, threatening hostilities, he was appointed lieutenant-gen. and commander-in-chief. On the Dec. 12th, 1799, he was exposed in the saddle, for several hours, to cold and snow, and attacked with acute laryngitis, for which he was repeatedly and largely bled, but sunk rapidly, and died, Dec. 14. His last words were characteristic. He said: “I die hard; but I am not afraid to go. I believed from my first attack that I should not survive it. My breath cannot last long.” A little later he said: “I feel myself going. I thank you for your attentions; but I pray you to take no more trouble about me. Let me go off quietly. I cannot last long.” After some instructions to his secretary about his burial, he became easier, felt his own pulse, and died without a struggle. He was mourned even by his enemies, and deserved the record: “First in peace, first in war, and first in the hearts of his countrymen.” Washington was 6 ft. 2 in. high, with brown hair, blue eyes, large head, and strong arms; a bold and graceful rider and hunter; attentive to his personal appearance and dignity; gracious and gentle, though at times cold and reserved; childless, but very happy in his domestic relations and his adopted children—nephews and nieces. His best portraits are those by Stuart, and statue by Houdin at Richmond. He was an exemplary member of the church of England.—See art. UNITED STATES; also Sparks’s *Life and Writings of Washington*, 12 vols. 8vo (Boston, 1834-37); *Life of Washington*, by chief-justice Marshall, 5 vols. 8vo (Philadelphia, 1805); *Life of Washington*, by Washington Irving, 5 vols. 8vo (New York, 1855-59); etc.

WASHINGTON, GEORGE (*ante*), 1732-99; b. Bridges creek, Westmoreland co., Va., the eldest of four sons of Augustine Washington, by his second wife. His father, who died in 1744, bequeathed to George the lands and mansion which were the family homestead at the time of his decease. The other children were all handsomely provided for by his will, and to the widow was left a life-interest in the property of those by his second marriage. But while the family were thus left in good circumstances, and large

landed proprietors, the facilities for education in the colonies—particularly in the south—were at this time so meager, that the younger children were forced to depend on the poor common schools of the neighborhood, where they acquired but the veriest rudimentary branches. Such education as he received, George completed by the time he was 16 years of age, his last two years of schooling having been devoted mainly to the study of engineering-geometry, trigonometry, and surveying; probably from his having a mathematical turn of mind, and also because the profession promised advantages, in view of the wild state of the country, and the increasing demand for accurate surveys. Besides, George was athletic in form, given to much exercising, a graceful and expert rider, and fond of the wild life of the woods and encampments. He had the customary boyish proclivity toward imitation of military service, possibly in a marked degree, and appears to have been generally chosen as their leader, and to have been deferred to in the settlement of disputes which arose among them by the companions of his youth. As a growing lad, he was not remarkable in his aptitude for book knowledge; was rather reserved and sedate in his demeanor; and was more than is usual among boys of a religious turn of mind. Another reason for his adopting the profession which he did, was the aversion of his mother to parting with him for long periods, an objection which prevented him from accepting a position in the British navy, when it was offered him by admiral Vernon. In 1748 he received a commission as public surveyor, and the summer months of the next three years were occupied by him in the duties of his profession: more particularly in the region of the Alleghanies, and ranging over the immense tracts of land owned by lord Fairfax. Surveyors were scarce, and the remuneration was ample, and as the young Virginian was economical, he saved money, and acquired property by purchase, long before he reached his majority. This fact, and the qualities of character which he displayed, gained him a solid reputation; and he was thus early regarded with esteem and confidence by the leading men in the province. The year 1751 found the frontiers threatened by the French and Indians, and frequent attacks and depredations occurred, necessitating some provision for the public safety. The colony was accordingly divided into military districts, to each of which an adjutant-general was appointed, with the rank of major, and a salary of £150 per annum. George Washington received one of these appointments, and entered with zeal on the study of the art of war and military tactics and strategy, under experienced provincial officers, among whom was his elder brother, who had seen service on the Spanish main. These studies were varied by an excursion with his brother (Laurence Washington) to Barbadoes, whither the latter was sent by his physicians; and who, on his death soon after, bequeathed to George the estate of Mount Vernon, which had been left to him by his father. The care of this property, and his military duties occupied George until 1753, when he was sent as a commissioner, by governor Dinwiddie, to gain information concerning the intentions of the French, who had sent an expedition to the headquarters of the Ohio. Washington acquitted himself of this mission very creditably, displaying great judgment, coolness, and address. In the spring of 1754 he was made-second in command of the six companies which formed the military establishment of the colony, and with three of these companies, was sent forward to occupy the outposts of the Ohio. This was his first campaign, and he at once distinguished himself by defeating a detachment of the French under De Jumonville; and, his superior officer dying suddenly, he was raised to the chief command of the detachment. In 1755 Washington became attached to general Braddock's staff, and passed through the ill-fated campaign of that year with great *éclat*, his personal bravery under fire becoming thoroughly established; while it was recognized that the fact of his wise counsel not having been listened to, had been in no slight measure the cause of Braddock's defeat. The duty now fell to Washington to reorganize the provincial troops, and he retained the command of them until the close of the campaign of 1758, when he resigned his commission, and retired into private life; dissatisfied, as it would appear, with the course of the government in failing to recognize the claims of provincial officers, and in preferring to them the officers of the royal army. On Jan. 6, 1759, Washington married Mrs. Martha Custis, a young widow with two children, wealthy in her own right. The management of her large estate combined with that of his own, now occupied the most of his time, at least until about 1763. Having been elected to the house of burgesses of Virginia, he now began to appear prominently in public affairs, attending regularly every meeting of the assembly; and, though seldom speaking, taking care to be thoroughly informed upon every prominent public question. He moved much in society, also; practiced a generous hospitality at Mount Vernon; associated constantly with the leading men of the colony; and soon, and imperceptibly, he had gained a recognized position as a man of profound ability and marked personal influence. At this time, he was frequently made the depository of important trusts, and was very often chosen to act as arbitrator in disputes arising among the colonists. His devotion to business and affairs was untiring; his industry extraordinary. He personally took charge of all his numerous accounts and business records, conducted his large and increasing correspondence, and drafted all his own contracts and deeds. At the outbreak of the revolution, he was recognized as the leading man in the colony of Virginia.

Washington was one of the six Virginian delegates appointed to the first continental

congress; and in June, 1775, was appointed by that body commander-in-chief of the continental army. For this important position his previous education had exactly adapted him. Not only was he skilled in military affairs: taught by precept and experience the art of war; but his extensive knowledge of the geographical character of the country, and his familiarity with the characteristics and qualifications of the royal army, made him certainly the most dangerous antagonist as a commanding officer, with whom that army could have to cope in the colonies.

Immediately after his appointment Washington left Philadelphia and joined the army at Cambridge, assuming command on July 2, 1775. This army numbered 17,000 men, all told, including the sick. It was in want of everything which could make it an effective fighting force—arms ammunition, accoutrements; and, worse than all, *esprit de corps*. The course pursued by congress in making its appointments had occasioned much discontent among the general officers; the organization was defective; a commissary and adj. gen. were more needed than a brave warrior, or a skillful tactician. In Washington, fortunately for the country, were combined all three. He proceeded at once to complete an effective organization of his small army, by forming it into six brigades of six regiments each, keeping the troops from each colony as far as practicable, together, and placing them under a commander from their colony. He sustained a constant correspondence with congress; pressing his views earnestly upon that body, and, though slowly, with marked success. All the officers were commissioned anew by congress, and by degrees a continental army was formed. Washington corresponded with the heads of the different colonial governments, and afterward with the governors of the various states; and by these various means succeeded at length—not only in creating the American army, but in becoming the sole channel of communication between it and the numerous and complicated depositories of authority in the United States. But all this was accomplished amid embarrassments innumerable. The army itself became diminished by the expiration of terms of enlistment; there were cabals among the officers, and disagreements with the civil authorities; yet, despite all opposing influences, the British were held in check during the year 1775, and until a new army could be collected, and arms and ammunition supplied. On March 4, 1776, the Americans took possession of Dorchester heights, and on the 17th the British evacuated Boston, and their fleet put to sea: whereupon Washington at once proceeded to New York, with the design to prevent a landing. In this he was foiled; partly through the incompetence of his own officers; partly on the account of the royalist strength in New York. The landing was effected, and the Americans were defeated in the battle of Long Island, Aug. 27, 1776; and Washington was forced to abandon New York to its fate, and retreat up the e. bank of the Hudson. He crossed the Hudson, Nov. 12, with only 4,000 men; was hotly pursued through New Jersey by the British; and, when he crossed the Delaware into Pennsylvania, had less than 3,000 weary, half-starved, dispirited soldiers under his command. Three weeks later, with only 2,400 men, he captured more than 1,000 Hessians at Trenton; stole away from the superior forces of Cornwallis, defeating his reserve at Princeton; and by Mar. 1, 1777, not a British or Hessian soldier was to be found in New Jersey, save a remnant at New Brunswick and Amboy. Frederick the great declared, with regard to the achievements of Washington and his little band of heroes, between Dec. 25, and Jan. 4, following, that they were not excelled in brilliancy by any recorded in the annals of military actions. In the mean time congress had seen the necessity of enlisting a regular army of men for a longer period than a year, which had been its previous judgment; and it now conferred dictatorial powers on gen. Washington. The campaign of 1777 opened about the middle of June, and was disastrous to the Americans from the beginning. They were defeated in the battle of the Brandywine, Sept. 11; and the British entered Philadelphia two weeks later. On Oct. 4 they were again defeated at Germantown; and early in December, Washington and his half-clothed and worn-out command made their terrible march to Valley Forge; where on the 11th they went into winter quarters, in a fortified encampment. During that winter Washington and his troops were subjected to inconceivable privations; and to add to his embarrassment, a conspiracy among his own general officers had nearly resulted in deposing him from his command; and was only frustrated by the firmness and good sense of congress, and by the friendly influence of Lafayette and De Kalb, who fully sustained him in this trying moment. Meanwhile, the men suffered for lack of food and proper clothing; the quartermasters and commissariat departments were deranged and inadequate; and the patriot cause was at the lowest ebb of its fortunes. But congress took up the question of properly recruiting and providing the army; a treaty with France was ratified with great rejoicing on the part of the Americans; and the British, although only 20 m. distant from the American camp, permitted the winter and spring to pass without any offensive movement. All of these circumstances combined enabled Washington to open the campaign of 1778 in somewhat better condition, and with an army in good spirits. Howe evacuated Philadelphia June 18, and Washington crossed the Delaware with his whole army, attacking the enemy at Monmouth, when they retreated, after a sharp engagement. Washington continued his march to the Hudson, which he crossed, and encamped near White Plains. He now distributed his troops in a line of cantonments around New York, extending from Long Island sound to the Delaware; arranged for the defense of New England; and in December went into winter quarters. During the

whole of 1779 Washington retained his position in the highlands of the Hudson, and remained on the defensive. In 1780 the French government sent out count Rochambeau, who arrived at Newport, R. I., July 10, with an expedition; and combined operations were concerted, but not carried out on account of the naval superiority of the British. The features of importance of this year were the capture and execution of maj. Andre, and the discovery of the treason of Benedict Arnold. The year 1781 found Washington hampered by a vacillating and unreliable congress, doubtful of its own powers, and, although now strongly supported by the French auxiliary army and liberal supplies from France, unable to bring these advantages into full use and application. But in the latter part of September the Americans and French united completely invested Yorktown, Va., where was lord Cornwallis, with the British force. On Oct. 17 the latter proposed a cessation of hostilities; and two days later he capitulated with his whole army. This concluded the active operations of the war, and the following year was chiefly occupied by Washington in endeavors to heal quarrels among his officers, and to obtain for them from congress the concessions they demanded, and to which they were doubtless rightfully entitled. There is no doubt that had Washington so desired, he could at this time have founded a monarchy, sustained by the bayonets of his army. He took the course, on the contrary, of quelling this disposition on the part of his soldiers, whenever it showed itself. On Nov. 25, 1783, the British evacuated New York; on Dec. 4 he delivered his farewell address to the army; and on Dec. 23 he resigned his commission and retired into private life.

During the next five years after the close of Washington's military career, he found sufficient occupation in attending to the affairs of his homestead and property, and in fostering the progress of his native state. Mount Vernon was now constantly the scene of a profuse hospitality, over which Washington presided with the courtly dignity and grace which were natural to him, and which he dispensed with princely generosity. In the convention of 1787, which framed the constitution of the United States, Washington acted as a delegate from Virginia. He was unanimously chosen the first president of the United States, and on April 30, 1789, took the oath of office in New York, where congress was then sitting. Washington's administration of the civil government was marked by the methodical precision which had characterized his conduct through life. His conscientious habit of undertaking no duty until he comprehended its entire scope and bearing, was also specially apparent in his new position. He thoroughly informed himself concerning all affairs of state, and every political act of importance which had been performed by the government and its agents since his retirement. He personally directed the organization of the different departments of the government under the new system, and in accordance with the constitution, and no act of his better showed the solemn seriousness which he attached to the great drama now being performed on the western continent, than his appointment to the offices of heads of these departments of such distinguished and able men as Jefferson, Hamilton, Knox, Randolph, and Jay. Congress opened in January, 1790; and meanwhile Washington had found time to make a tour through the eastern states, to better acquaint himself with the views of those who were presently to lay the foundation for the commercial and manufacturing supremacy of the United States. Before congress, in his first message, he presented a profound and eminently judicious series of suggestions of laws and provisions, which were at once made the basis of legislation. Not only the skeleton of a new government was now being informed with life and made active and puissant; but the framework of the whole political and social system of the country was being erected. The people were, in the case of their social formation, assimilating; while, in that of their political organization, they were separating into two parties; the same two parties which were henceforth—in different forms, and at times under different names—to sway the course of the empire of the west. The democrats and federalists each included the names of many of Washington's closest personal and political friends. Not only on this account, but from the sense of justice which ruled his life, he refrained sedulously from allying himself with either party; and, on the contrary, strove to reconcile the differences between the leaders which he foresaw must inevitably in the future bring about wider differences among the people. The success of his first administration, and the universal sense of a security under his direction which did not appear in the least to be certain under that of any other, produced a general anxiety, as it drew to a close, that Washington should accept the reins of government for a second term. Jefferson and Hamilton—wide apart as the poles in their political opinions, and personally at enmity with each other—agreed in this; and each wrote a letter to Washington urging his compliance with what was now a great popular demand. To their solicitation and those of others he acceded; and on the 4th of March, 1793, took the oath of office for the second time as president of the United States. The very beginning of Washington's second administration saw the United States drawn into the vortex of European politics. The French revolution and the "reign of terror" had culminated in the French republic. Great Britain and France were at war, and gratitude seemed to demand that the western republic should sustain her sister state in the existing struggle. But Washington was especially opposed to foreign complications, and while he accepted the French republic, and received its representative, he steadfastly adhered to his resolution, and the proclamation of neutrality was published April 22, 1793. Now arose factions in the United States, on the one side seeking to

enforce practical adherence to the cause of France; on the other, sustaining Washington, though accused bitterly of bias in favor of the ancient enemy of America. Between democrats and federalists the line was now drawn strictly on this basis. Dissensions and resignations occurred in the cabinet; and Jacobin clubs were formed among the people, and were as virulent in the expression of their animosities as were their prototypes in France. In the midst of all the excitement consequent to such a state of affairs, Washington sent John Jay as envoy extraordinary to England, who negotiated the treaty which was signed by Washington on Aug. 18, 1795. The publication of the terms of this treaty aroused the most violent discussion in and out of congress. The latter body called upon the president for the correspondence and instructions involved in the negotiations, and these Washington declined to furnish. Acrimonious debate followed, but the president held firm to his position, and the matter died out. Thus by his wisdom and determination did Washington preserve his country—just emerging from the trials and vicissitudes of the war of independence—from engaging in entangling alliances which would certainly have precipitated renewed warfare, and perhaps have rendered impossible the growth of the magnificent superstructure of which he had laid the solid foundation. On Sept. 15, 1796, Washington published his farewell address to the country he had formed—almost out of chaos. He delivered his last presidential message; a new election resulted in placing John Adams in the presidential seat—though Washington could have been elected for a third term, had not the pressure of his private affairs induced him to decline the honor; and the father of his country retired to his home at Mount Vernon, followed by the love and admiration of a people who now fully recognized his public spirit, his stanch integrity, and the extent of his intellectual resources. There he died on Dec. 14, 1799; his epitaph a nation's praise. Europe paid tribute to the memory of Washington; the sermons and addresses in commemoration of his noble life grew into a literature; his name was perpetuated in the names of a multitude of American localities, and his countenance became a perpetual heirloom among his people.

WASHINGTON, WILLIAM AUGUSTINE, 1752-1810; b. Virginia; was educated for the ministry, but was appointed a captain in the continental army, and fought in the battles of Long Island, Trenton, and Princeton. He was in command of a troop of light-horse in South Carolina for a time, and distinguished himself by his gallantry at the battle of Cowpens, receiving in recognition thereof a silver medal from congress. During the southern campaign of 1781 he was captured at Eutaw Springs, and was held a prisoner until the war ended. He afterward settled in Charleston, S. C., and in 1798 was a member of gen. Washington's staff, with rank as brig. gen.

WASHINGTON AND LEE UNIVERSITY, at Lexington, Rockbridge co., Va., founded in 1782 as "Liberty Academy;" in 1796 it took the name of "Washington Academy;" in 1813 its designation was changed to "Washington College;" and in 1871 it assumed its present title. In 1796 gen. Washington gave it 100 shares of stock in the James river canal company which were converted into an interest-bearing fund of \$50,000. In 1803 it received \$25,000 from the Cincinnati society; and, in 1826, another bequest of \$40,000. Its present name is intended to pay equal honor to the leading gen. of the south in the late rebellion with that before conferred upon the "father of his country." The university has no denominational patronage. It has funds amounting to \$200,000, and an annual income of \$12,000. Its buildings and grounds are valued at \$150,000. In laboratories and apparatus it has a complete outfit, and its extensive museum comprises zoological, mineralogical, and geological cabinets, with a herbarium of 5,000 specimens. The university is divided into thirteen elective schools, including law, engineering, and the applied sciences. In 1880 it had 9 professors, 11 other instructors, and 7 lecturers; students, 200; alumni, 3,000. President, gen. G. W. Custis Lee.

WASHINGTON TERRITORY, a territory of the United States, in lat. 45° 20' to 49° n.; long. 117° to 125° w.; bounded n. by British Columbia, e. by the territory of Idaho, s. by the Columbia river, which separates it from Oregon, w. by the Pacific ocean. Estimated area, 69,994 sq. miles. Its capital is Olympia. Port Townsend is a flourishing site on Puget's sound; and other new towns, with a multitude of mining villages and camps, are scattered over the territory. The chief rivers are the Columbia or Oregon, on the southern border, which also drains the whole territory e. of the Cascade mountains; the Okonagan, its great northern branch, flowing from the lake of the same name in British Columbia; Lewis or Snake river; and numerous streams emptying into Puget's sound and the Pacific. Washington territory is rich in sounds and harbors. Puget's sound, from 1 to 4 m. wide, and 8 fathoms or more in depth, opens out of the strait of Juan de Fuca, penetrating 100 m. into the heart of the country, and with its bays and islands forming one of the finest collections of harbors in the world. Hood's canal, a narrower channel on the w., extends 60 miles. Bellingham, on the eastern shore of the gulf of Georgia, has a tide of 20 feet. There are also large and deep harbors, suitable for naval stations, on the strait of Juan de Fuca. The great range of Cascade mountains, a continuation of the Sierra Nevada, passes through the center of the territory from n. to s., about 100 m. from the coast. Its chief summits are mount Baker, lat. 48° 44', 11,900 ft., an active volcano; mount Rainier, lat. 46° 40', 12,230 ft., an extinct volcano; mount St. Helen, 9,550 ft., nearly extinct; mount Adams, 9,000 ft., entirely extinct. East of the Cascade mountains, the soil is thin, rocky, dry, and sterile,

but with fertile valleys; on the w., and especially around Puget's sound, the soil is rich, and the country covered with a dense evergreen forest. West of the Cascades, the formation is of tertiary sandstone; near the sound, the alluvium has a depth of 100 feet. Lignite, or tertiary coal, is found in many places. The mountains are granitic, and near mount Adams is a large field of lava. East of the Cascade mountains, the formations are igneous and metamorphic, with trap and volcanic scorie. There are rich gold-diggings in the north-eastern portion. The climate in the western district is almost precisely that of England, with a rain-fall of 53 in.; e. of the mountains, there is but a quarter of the rain-fall, and extremes of heat and cold. The timber in the western district is of great richness and abundance; the red fir and yellow fir (*abies Douglasii* and *A. grandis*), growing 300 ft. high, and 6 to 8 ft. in diameter. The vegetable and animal productions are the same as in Oregon. Fish are very abundant, a dozen species of salmon filling all the streams, with halibut, cod, herrings, and sardines in great quantities. The water and mountain scenery is among the finest on the continent. The chief product is timber, of which 250,000,000 ft. were produced in 1875. Steam saw-mills on Puget's sound and Hood's canal saw 150,000 ft. a day. Wheat, barley, oats, potatoes, and the harder fruits are produced in abundance. This territory was discovered by Juan de Fuca, a Greek, in 1592; visited by a Spanish navigator in 1775, and three years after by capt. Cook. In 1787, Berkeley, an Englishman, rediscovered the strait of Fuca, which had been missed by others. Capt. Gray, an American, visited the coast in 1791; and the English capt. Vancouver in 1792; capt. Lewis and Clark explored the interior during the presidency of Jefferson, and settlements were made by the Hudson's bay company in 1828; in 1845 American settlers entered the territory, then a part of Oregon. It was constituted a separate territory in 1853. Wars with the Indians in 1855 and 1858 retarded immigration, but in the latter year 15,000 persons were attracted by the discoveries of gold diggings at Fraser's river, many of whom became permanent settlers. White pop. '70, 22,195; Indian pop. '69, 15,808.*

WASHINGTON TERRITORY (*ante*) is divided by the Cascade mountains and the Columbia river into western Washington, lying w. of the Cascade mountains and extending to the Pacific; central Washington, between the Cascade mountains and the Columbia river; and eastern Washington, e. of the Columbia. Western Washington, comprising two-fifths of the whole, is a densely timbered country with a few fertile prairies and some rough and broken mountain lands. The climate is relatively warm in winter and cool in summer, and the rainfall is large. The central division embraces the summits of the Cascade mountains, the valley of Yakima, and a plateau stretching to the Columbia river. The mountains on its western border form an unbroken range from 5,000 to 8,000 ft. above the sea, and several lofty peaks rise from 2,000 to 6,000 ft. higher. The regions about the river valleys are fertile; but the land of the plateau is barren, sterile, and dry. Eastern Washington comprises the valley of the Columbia and its large affluents, the Clark, Spokane, and Lewis rivers, and the Spokane plains or plateau—the latter elevated and sterile, and without forests; the former well watered, fertile, and containing much timber. In this division the climate is dry and the summers are warmer and the winters colder than w. of the mountains. The principal geological formations in the first division are the Cambrian and Silurian, eozoic, cretaceous, and tertiary. Anthracite and bituminous coal is found in various parts, and mines are worked here and there that yield a good average. There are also at the head of the s. fork of the Yakima river gold mines that some years since gave promise of extensive deposits, but from 1863 the yield has steadily declined. The central and s.e. portions of the territory are of volcanic formation. On the Pacific the territory has a coast-line about 180 m. long. The most noted headlands are cape Disappointment or Hancock, at the mouth of the Columbia, and cape Flattery at the entrance of the strait of Fuca. The principal indentations are Shoalwater bay, n. of the Columbia, and Gray's harbor, both of which are accessible by large vessels. The strait of Fuca extends e. 80 m. and then divides into two channels, Rosario strait on the e. and the canal de Haro on the w., which inclose the archipelago of Washington sound and connect on the n. with the gulf of Georgia. Puget sound extends s. into the territory from the e. end of the strait of Fuca 80 m. in a direct line and abounds in excellent harbors. This sound and the strait of Fuca, with its connecting waters, furnish a coast-line of several hundred miles. The Columbia river affords ship navigation nearly to the Cascade mountains, and throughout the territory this river and its main affluents, the Lewis and Clark, afford steamboat navigation, with occasional interruption from rapids. The Lewis flows n., forming the s. portion of the Idaho boundary for 30 m., and then entering Washington territory flows w. 150 m. to the Columbia. It is navigable to the Idaho border. The chief lakes in west Washington, none of them large, are Washington, Union, American, and Whatcom. In eastern Washington the largest body of water is lake Chelan.

Washington territory originally formed part of Oregon, and when it was erected into a separate division in 1853 it comprised the region lying between the Pacific ocean and

* In 1860, before the abstraction of the eastern and larger portion of its area, which is now included in the separate territories of Idaho and Montana, Washington territory contained 193,071 sq. miles.

the summit of the Rocky mountains, and n. of the Columbia river and the 46th parallel. In 1859, however, when Oregon was admitted into the union, the region between the e. boundary of that state and the Rocky mountains and n. of the 42d parallel was added to this territory. It then comprised 193,071 sq. m., embracing the present territory of Idaho and parts of Montana and Wyoming. The first American settlement was made at Tumwater in 1845 by a few families who had ventured across the plains. Since then there have been one or two tides of immigration to the territory caused by discoveries of gold; but it is too remote as yet to offer much inducement to settlers compared with the more eastern territories. Of the total population in 1870, 18,931 were of native and 5,024 of foreign birth, 14,990 males and 8,965 females. The number of families was 5,673, with an average of 4.22 persons to each; the number of dwellings 6,066, with an average of 3.95 persons to each. About 9,800 persons were engaged in occupations, of whom 3,771 were employed in agriculture, 2,207 in professional and personal services, 1,129 in trade and transportation, and 2,633 in manufactures and mining. By the census of 1880 the total population was 72,120, of whom 59,259 were of native and 15,861 of foreign birth. The males numbered 45,977 and the females 29,143. About a third of the inhabitants are settled east of the Cascade mountains, principally in Walla Walla and Columbia counties. A majority of those settled w. of the mountains are located around Puget sound; the others on the Columbia river. The largest towns are Walla Walla, Olympia, Seattle, Steilacoom, Port Townsend, and Vancouver. There are seven Indian agencies in the territory for the supervision of the tribal Indians, who number about 15,000 and occupy 3,933,500 acres of land as a reservation. The names of these agencies, which have become places of more or less importance, are Colville, in the n.e.; Neah Bay, on the coast; Quinalt, also on the coast; Nisqually, on Puget sound; Skokomish, on Puget sound; Tulalip, on Puget sound; and Yakima, in the south. In 1870 the number of acres of land in farms in the territory was 649,139, of which 192,016 were improved. The productions were 186,180 bushels of spring wheat, 30,863 of winter wheat, 4,453 of rye, 21,781 of Indian corn, 255,169 of oats, 55,787 of barley, 316 of buckwheat, 15,790 of peas and beans, 280,144 of potatoes, 179 of clover seed, 1682 lbs. of tobacco, 162,713 of wool, 407,306 of butter, 17,465 of cheese, 6,162 of hops, 629 of wax, 25,636 of honey, 612 gallons of sorghum molasses, 235 of wine, and 30,233 tons of hay. The live stock on farms consisted of 11,138 horses, 943 mules and asses, 16,938 milch cows, 2,181 working oxen, 28,135 other cattle, 44,063 sheep, and 17,491 swine. The manufacturing establishments in the territory in 1870 numbered 269; employed 1000 hands; possessed a capital of \$1,893,674; paid \$574,936 in wages; used raw material annually valued at \$1,435,128; and produced goods worth \$2,851,000. The most important establishments were 46 saw-mills, 7 planing mills, and 20 flouring and grist-mills. The trade of the territory is chiefly in lumber and canned fish, both of which are shipped to the San Francisco markets in large quantities and the latter to the east. The territory constitutes one customs district, that of Puget sound, of which Port Townsend is the port of entry. For the year ending in July, 1875, the exports to foreign countries amounted to \$759,230, including 33,907,000 ft. of assorted lumber valued at \$352,510, and live stock, grain, provisions, etc., valued at \$406,720; the imports amounted to \$49,125. The railroad facilities for internal traffic consist of the Pacific division of the Northern Pacific and the Walla Walla and Columbia narrow-gauge road. The former extends from Kalama on the Columbia river to Tacoma on Puget sound, 105 m., and is designed to form part of the trans-continental line completed west to the Missouri river in Dakota. The latter road extends from Walla Walla to Wallula on the Columbia river, 32 miles. There are no banks or insurance companies in the territory.

The assessed value of property in the territory in 1875 was \$14,569,156, and the territorial tax levied amounted to \$58,295. The territorial debt at that time was \$20,559. The total receipts for school purposes during the same year were \$39,394. The schools are under the supervision of a superintendent appointed by the governor and council every two years, and are supported by taxation, fines under criminal statutes, and by private contributions. In 1875 there were 305 districts and the school population was about 11,900. The number of children enrolled was 7,592; the number of schools 238; of teachers, 240. The only institutions for higher education are the territorial university, at Seattle, which has an endowment of \$15,000 and buildings and grounds valued at \$50,000; and the Holy Angels' college, at Vancouver, a Roman Catholic institution which was organized in 1865. In 1870 the number of libraries in the territory was 102, containing 33,362 volumes, of which 72, with 19,810, volumes were private. The number of newspapers published is about 17, of which 3 are dailies, and 13 weeklies. The religious denominations in 1875 were 12 Baptist, 5 Christian, 6 Congregational, 9 Protestant Episcopal, 24 Methodist, 7 Presbyterian, 19 Roman Catholic, 1 Second Advent, 10 United Brethren in Christ, and 1 Union.

The executive officers are a governor and secretary, appointed by the president every four years, and an auditor and treasurer, appointed by the governor every two years. The legislature consists of a council of 9 members and a house of representatives of 30 members, both elected by the qualified voters for two years. The judicial power is vested in a supreme court, three district courts, a probate court in each county, and justices of the peace. Every male citizen 21 years of age is allowed to vote, pro-

vided he has resided within the county in which he offers to vote a certain prescribed time. The territory is represented in congress by one delegate.

WASHINGTON UNIVERSITY, founded in St. Louis, under an act of incorporation by the state of Missouri in 1853, comprises several departments, and is intended to embrace the whole range of university studies, except theology, and to afford opportunity of complete preparation for every sphere of practical and scientific life. The charter provides that "no instruction, either sectarian in religion, or partisan in politics, shall be allowed in any department of said university; and no sectarian or party test shall be allowed in the election of professors, teachers, or other officers of said university, or in the admission of scholars thereto, or for any purpose whatever." The university comprehends—1. Smith academy, essentially a preparatory school; 2. Mary institute, a school for young ladies; 3. the college; 4. the polytechnic school; 5. the law school. The interest of a lecture endowment fund is used for the support of lectures calculated to promote the objects of the institution. Forty scholarships of \$1,000 each have been founded and are available to students under proper regulations. A trust fund of \$30,000 has been accepted from the Western sanitary commission for the establishment of 20 free scholarships in the college or polytechnic school, to be filled by children of descendants of union soldiers in the late war. The polytechnic school embraces courses in civil and mechanical engineering, chemistry, mining and metallurgy, building and architecture, and science and literature, for all of which the university is well supplied with apparatus. The collections in mining and metallurgy contain over 13,000 specimens. A collection of casts of celebrated fossils, well known throughout the country as the most valuable of its kind, forms one of the most attractive features. Number of professors in 1880, 29; other instructors, 35; students in all departments, 1021. President, William G. Eliot, D.D.

WASHITA, a river of the United States, rises on the western borders of Arkansas, and runs e. and s.e. through Louisiana, emptying into the Red river, 30 m. from its mouth; it is 500 m. long, and navigable to Camden, 300. Its chief branches are the Saline river, La Fourche, Tensas, and Little Missouri.

WASHOE, a co. in n.w. Nevada, having the Truckee river on the s.e. and bordering on California; 1150 sq.m.; pop. '80, 5,664—3,678 of American birth, 902 colored. Co. seat, Reno.

WASHOE SILVER MINES, a rich deposit of siliceous argentiferous galena, discovered in 1859 in a range of hills on the e. side of the Sierra Nevada, on the borders of California and Nevada territory, near the sources of Carson's river, 160 m. e. by n. of Sacramento. The ore produces as much as \$2,000 to the ton, and is largely exported to England. The discovery of these mines caused a great excitement in California, and a large emigration.

WASHITENAW, a co. in s.e. Michigan; produced in one year 906,011 lbs. of wool; 720 sq.m.; pop. '80, 41,848—33,922 of American birth, 1,219 colored. Co. seat, Ann Arbor.

WASP, *Vespa*, a Linnaean genus of insects, now forming the family *vespidae*, a very numerous and widely distributed family, of the order *hymenoptera* and section *aculeata*. They are distinguished from all the other *hymenoptera* by their wings, when at rest, being folded throughout their entire length. The wings of all the wasps exhibit a similar pattern of nervation, with one marginal and three submarginal cells, and an incomplete terminal submarginal cell. Their antennae are usually angled, and somewhat club-shaped at the extremity. The maxillae are long and compressed; there are glands at the extremity of the labrum; the tongue is trifid, its tips lacinated. The body is naked, or but slightly hairy. The general appearance resembles that of bees; the color is usually black, with yellow markings. The division between the thorax and abdomen is very deep, the abdomen often stalked. The legs are not fitted for collecting pollen, like those of bees. The females and neuters have stings, generally more formidable than those of bees. The larvae have tubercles instead of feet. The wasps differ very widely in their habits, some being solitary, the family *cumenidae* of some entomologists; others social, to which the name *vespidae* is sometimes restricted. Neuters are only found among the social wasps. Some of the solitary wasps make curious burrows in sand, or construct tubes of earthy paste on the sides of walls, in which they form cells for their eggs, at the same time placing there a store of food for the larvae, some of them using for this purpose perfect insects, others caterpillars, which are stung so as to be rendered incapable of motion without being killed. Others make little earthen cells on the stems of plants, and store in them a little honey for their young. The social wasps have various modes of constructing their nests, which are sometimes formed in excavations in the ground, sometimes attached to walls, boughs of trees, etc., and formed of a paper-like, or sometimes a pasteboard-like substance, produced by mixing into a pulp, with their saliva, small particles of woody fiber, torn by their broad and powerful mandibles from gate-posts, palings, the bark of trees, etc. Great diversities are to be seen in the arrangement of the combs within the nest. The combs are made of a substance similar to the outer covering of the nest, but generally thicker and firmer. As the nest is enlarged, new paper is made for the purpose, the whole nest being inclosed in the last-

made envelope, and the inner ones, which sufficed for its former size, are removed to give place to combs. Several inner envelopes are generally found in a wasp's nest, so that paper-making must be a great part of the industry of these insects. The nests of the wasps of tropical countries are often very large, sometimes 6 ft. long, and the communities very numerous. In colder regions the increase of the community and of the nest is arrested by the approach of winter, when the males and the neuters die; but a few of the females survive, passing the winter in a torpid state in some retreat, and found new communities in spring. In a community of wasps there are many perfect females—not a single queen, as in the case of hive bees. Wasps in their perfect state feed very indiscriminately on a great variety of animal and vegetable substances, as insects, flesh, fruit, sugar, etc. Grapes or gooseberries, especially if over-ripe, are often found to contain a wasp in the interior. Wasps often invade bee-hives and steal honey. There is a Brazilian species (*myropetra scutellaris*) which stores up honey like bees. Wasps may be killed by pouring hot water on their nests; but more easily by the vapor of burning sulphur, when the nests are not in the ground; or ether or chloroform may be used to stupefy the wasps, so that the nest may be safely destroyed. The largest British species of wasps is the hornet (q. v.), found only in the s. of England. The most abundant species, diffused over all parts of the country, are *vespa vulgaris* and *V. media*. The former is about eight lines long. The front of the head is yellow, with a black center; there are many yellow spots on the thorax, and a yellow band with black points at the posterior margin of each ring of the abdomen; the rest is black. *V. media* is very similar, but rather larger. *V. vulgaris* makes its nest in the ground; *V. media* suspends it generally to the branches of trees, but sometimes to the projections of walls.

WASSON, DAVID ATWOOD, b. Me., 1823; studied at an academy; was a teacher at the age of 19; spent a year in Bowdoin college; went to sea as a common sailor for his health; studied law, but relinquished its practice after a short time; entered the congregational theological seminary at Bangor, 1848, and completed the course; settled at Groveland, Mass., 1851; changed his theological views, and became a preacher of an independent church there, and, with an interval of six months, remained till 1857; supplied the society of Theodore Parker for a few months, and retired from failure of health; has been engaged in the Boston custom-house for four years, and spent two in Germany. He has written much for reviews.

WASTE, in English law, has several meanings. (1) It means a common belonging to a manor, and by analogy is often applied to pieces of land of no great value, lying at the sides of highways or the sea-shore. The presumption is that a strip of land adjoining a highway belongs to the owner of the land next to it. (2) Waste also means the spoil or destruction to houses, gardens, trees, or other corporeal hereditaments, committed by tenants for life or for years to the injury of the remainder-man or reversioner. Thus, he who has a life estate, or an estate for years, in a house or land, cannot change the nature of things, as by turning meadow into arable, nor wood into pasture, though he may better a thing of the same kind, as by draining the meadow, etc. The alteration caused by thus diminishing an inheritance is called waste, and its characteristics are to diminish the value of the inheritance, or to increase the burden upon it, or to impair the evidence of title. Waste is either voluntary or permissive. The former consists in the commission of acts which the tenant has no authority to do—such as pulling down buildings, felling timber, or opening mines. Permissive waste arises from the omission of acts which it is the tenant's duty to do—as, for example, suffering buildings to go to decay by wrongfully neglecting to repair them. There is, however, incident to every estate for life or years, the right to take estovers—that is, so much wood, stone, etc., as is required for use on the tenement, for repairs, husbandry, and the like purposes. It is a common practice, in family settlements, to provide that, in addition to this privilege, the estates of the tenants for lives shall be without impeachment for waste. The effect of this clause is to enable the tenant to take timber, minerals, etc., severed by himself or others during the continuance of his estate. But even where the tenant holds without impeachment of waste, he is not entitled to cut down ornamental timber; and if he do so, a court of equity will restrain him by injunction. Wherever the tenant is committing acts of a character especially destructive to the inheritance, or still more, acts of wanton or malicious mischief, the court of chancery holds that his legal power to commit waste is being used unconscientiously, and will restrain him.

WASTE (*ante*) in the law of real property, is "any act or omission of the tenant of a particular estate, by which the estate of the reversioner or remainder-man is diminished in value." It may be voluntary, where the act of the tenant is wilful; or permissive, rising from neglect. The waste may be by a tenant for life or for years as against him who holds the fee, but not by tenant in fee simple against his heir, or by tenant in fee tail against the next donee.

WASTE LANDS, according to the general use of the term, are uncultivated and unprofitable tracts in populous and cultivated countries. The term waste lands is not employed with reference to land not reduced to cultivation in countries only partially settled. There is a large extent of waste lands even in the British islands. Of the 77,800,000 acres which they contain, only about 47,000,000 are arable land and improved pasture; 2,000,000 acres are occupied with woods and plantations; 7,000,000 acres in Scot-

land consist of sheep-pasture, generally at a considerable elevation, and little improved by art; 8,000,000 acres in Ireland are uninclosed pasture, generally quite unimproved; 3,000,000 acres are mountain and bog; and the remainder consists of unimproved and very unproductive land of other kinds.

The improvement of waste lands is very much a question of expense. It is often more profitable to improve lands already cultivated, and to bring them into a higher state of cultivation and productiveness, than to reclaim waste lands; in attempting which, much money has often been lost. Much of the cultivated land of Britain is far from having been brought to the highest state of cultivation of which it is evidently capable, or to a state equal to that of the best cultivated lands of similar soil and situation. In many instances, however, waste lands have recently been improved with great advantage, and it seems probable that no small part of the waste lands of the country are capable of profitable improvement. The process must often be slow and gradual, especially where the soil is naturally very poor, as even the addition of large quantities of manure to very poor soils will not render them fertile, but on the contrary will be followed by a sterility greater than before. The quantity of guano which a rich soil would gratefully receive will destroy every vestige of vegetation on a very poor soil.

The waste lands of Britain are of very various character. Some of them are bogs, already sufficiently noticed in the article Bog. Others are marshes and fens, generally very near the level of the sea, and often within the reach of its tides, chiefly in the eastern counties of England. See BEDFORD LEVEL. Of these, a great extent has been reclaimed, and has become very productive; much still remaining, however, to be done. There are also extensive moors both in England and in Scotland, often of very poor soil, and often also at such an elevation above the level of the sea as to render profitable agriculture hopeless. This is not the case with all the moors, and it is sometimes possible to effect great improvement by drainage; so that land, formerly almost worthless, may be converted into good pasture. In many places the heath has been extirpated, and the moorland changed into good pasture, and even into good arable land. It is sometimes found very profitable to break up such land, even at very considerable elevations, and afterward to lay it down in pasture, the produce being much greater than it was before. Even in the most elevated tracts, drainage is beneficial; although it must always be considered whether or not drainage will pay. The highest sheep-pastures of the south of Scotland have been greatly improved by a kind of superficial drainage (*sheep-drains*), consisting of mere open channels for water; but in the greater altitudes of the Highlands, and amidst their more rugged steeps, even this is out of the question. In some cases, chiefly of the more level moorlands, much improvement is effected by *paring and burning*, the surface being pared off by the *breast-plough* or *paring-spade*, and burned, generally in heaps, of which the ashes are spread upon the soil. The application of lime is of great benefit in many cases, as is also that of chalk and of marl, but the expense must always be considered, and many tracts of waste lands are so situated that the application of such manures is impossible. Railways have rendered the reclamation of waste lands profitable in many districts in which formerly it would not have been so.—The chalk *downs* of the south of England may, in great part, almost be considered as waste lands, although used for sheep pasture; but they have been found capable of great improvement, although in a slow and gradual manner, by tillage, and the application of manures.—Sands near the sea-shore are fixed by sowing certain grasses (see AMMORHILA), and are capable of further improvement by cultivation and the application of manures; particularly where the sand is in considerable part calcareous. The most barren and hopeless sands are those which are almost entirely siliceous. Some time ago a company proposed to experiment on a large scale on sand of this kind, by conveying the sewage of London to the Maplin sands on the coast of Essex. Very different opinions were expressed by scientific men as to the probable result of the experiment, which was important both as to the reclamation of wastes and the disposal of sewage. Liebig deemed the siliceous sand incapable of profiting by the rich manure poured upon it. The company commenced their works, but failed to complete them.

WASTING PALSY is one of the terms applied to the disease described in this work under its old name of **TABES DORSALIS**.

WATAUGA, a co. in n.w. North Carolina, having the Blue Ridge mountains on the s.e. border; 450 sq.m.; pop. '80, 8,160—8,160 of American birth, 409 colored. Co. seat, Boone.

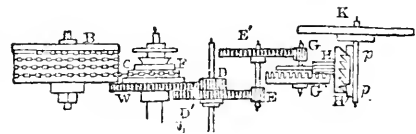
WATCH, a small portable machine for measuring time, the construction of which is essentially the same as that of a clock (see **HOROLORY**), except that the moving power is obtained from the elastic force of a coiled spring instead of from a weight, and the movement regulated, so as to be isochronous, by a balance and balance-spring (q.v.) instead of a pendulum. The going part of a watch consists of a train of wheels and pinions, kept in motion by a spring, called the main-spring; the last and fastest wheel of the train, the scape-wheel or balance-wheel, acting so as to keep in vibratory motion a balance whose movement, again—which is made isochronous by the action of another

spring called the balance-spring—regulates to a uniform rate the revolution of the scape-wheel, and consequently the motion of the rest of the train, and the uncoiling of the main-spring.

The main-spring is a thin ribbon of steel coiled in a barrel. The inner end of it is fixed to a strong spindle, the axis or *arbor* of the barrel, around which it is coiled, and the outer end is fixed to the inside of the barrel. By its tendency to uncoil itself, the spring sets the barrel in motion, and it produces as many revolutions of the barrel as it makes turns itself in unwinding. As its elastic force is greater when it is tightly coiled than when it has to some extent unwound itself, the spring, if its force were applied without modification to the watch train, would act upon it unequally, the power exerted diminishing as the spring uncoiled; so much so, that the watch could not go uniformly throughout the day, though it might keep time from one day to another. A piece of machinery, called a fusee, is employed to correct the variations in the force of the spring, and equalize the power exerted upon the train. The fusee is a cone with a spiral groove, connected with the barrel which contains the main-spring by a chain, one end of which is fixed at the broadest part of the cone, and the other end to the barrel. The barrel moves the fusee by means of the chain, which, as it runs off the sides of the fusee, is coiled upon the outside of the barrel. In winding a watch the key is placed on the axis of the fusee, and by the same movement the main-spring is coiled around its spindle, and the chain wound off the barrel, to cover the cone of the fusee. So when the spring is all coiled up, and its force upon the barrel is greatest, the chain is acting at the small end of the fusee, and its leverage upon the fusee is least; as the force of the spring diminishes, the chain having got to a broader part of the fusee, the leverage is increased; and the grooving of the fusee being, when perfect, arranged so that a section of the fusee along its axis would present two hyperbolas placed back to back, secures that the force of the spring, modified by the leverage of the chain, shall produce a uniform motion of the fusee. From the fusee this motion is communicated to the watch-train, the first wheel of the train—called the fusee-wheel or the great wheel—being set upon the fusee. The fusee is introduced in almost all English watches; but a great proportion of foreign watches, and most French spring clocks, have no fusee, and have the great wheel fixed on to the barrel. Accurate time-keeping is not to be looked for from such clocks or watches; but it is said that many of the main-springs made upon the continent are so skillfully contrived, that the force is pretty constant during the whole time of unwinding.

Between the train of wheels and pinions in a watch and that of a clock, until we come to the escapement, there is no difference, except that there is one more wheel and pinion in the watch-train than in the clock-train; the reason of which is, that the scape-wheel of a watch revolves, not like that of a clock, in a minute, but usually in about six seconds, making necessary an additional wheel to revolve in a minute and carry the seconds hand. A great variety of watch escapements are in use. The oldest, which is now going out of use, is the vertical escapement. It exactly corresponds to the crown-wheel escapement in clocks (see HOROLOGY). The accompanying figure shows a watch-train with this escapement. It may be useful also as indicating, in a general way, the arrangement of the wheel-work in a watch (fig. 1). The main-spring contained in the barrel B, sets in motion the barrel, which, by means of the chain *c*, moves at a uniform rate the fusee F, along with which turns the fusee-wheel W, the first or great wheel of the watch-train. It will be easily seen how, from the great wheel, motion is communicated successively to the center-pinion D, and the center-wheel D' (which turn in an hour); to the third-wheel pinion, E, and the third wheel, which is upon the same arbor, E'; and to the fourth or contrate-wheel pinion G, and the contrate-wheel G'. The upright teeth of the last named wheel move the balance-wheel pinion H, and with it the balance-wheel or scape-wheel H', which is fixed upon its arbor. The scape-wheel (and in this escapement the contrate-wheel also) is what is called, from its shape, a crown-wheel. Upon the arbor or verge of the balance K, are two pallets, *p, p*, at a distance from each other equal to the diameter of the scape-wheel, and so placed that, as the scape-wheel revolves, its teeth give them alternately an impulse in different directions, which keeps up the vibratory motion of the balance. The balance is made to vibrate isochronously by the action of the balance-spring (q.v.); and its vibration regulates the escape of the teeth of the scape-wheel, and so the motion of the whole train, exactly as that of the pendulum does in an ordinary clock. The vertical escapement is liable, though in a less degree, to the same objection as the old crown wheel and the crutch or anchor escapements in clocks. There is a recoil of the scape-wheel after one of its teeth has been stopped by a pallet, which interferes more or less with the accuracy and uniformity of the motion of the train. See HOROLOGY.

FIG. 1.



Almost immediately after the invention of the balance-spring, attempts began to be made to introduce an escapement which would produce greater accuracy than the

vertical escapement. Hooke, Huygens, Hautefeuille, and Tompion introduced new principles, each of which has since been successfully applied, though they all, from imperfect execution, failed at the time. The first real improvement was made by George Graham, the inventor of the dead escapement in clocks. This is called the horizontal escapement; it was introduced in the beginning of the last century, and it is still the escapement used in most foreign watches. The impulse is given to a hollow cut in the cylindrical axis of the balance, by teeth of a peculiar form projecting from a horizontal crown-wheel. Other forms of escapement in high estimation are the lever escapement, originally invented by Berthoud, improved by Mudge; the duplex escapement, the principle invented by Hooke, the construction perfected by Tyrer; and the detached escapement of Berthoud, improved by Arnold and Earnshaw. The last-mentioned is that which is employed in marine chronometers and in pocket-chronometers, as watches made in all respects like chronometers are called. The lever escapement is that which is used in most English watches. In it the scape-wheel and pallets are exactly the same as in the dead escapement in clocks. See *HOROLOGRY*. The pallets are set on a lever which turns on their arbor; and there is a pin in a small disk on the verge or arbor of the balance, which works into a notch at the end of the lever. The pin and notch are so adjusted, that when a tooth of the scape-wheel has got free, the pin slips out of the notch, and the balance is detached from the lever during the remainder of its swing; whence the name *detached* lever escapement, originally applied to this arrangement. On the balance returning, the pin again enters the notch, moving the lever just enough to send the tooth next in order to escape from the dead face of the pallet on to the impulse face; then the scape-wheel acts upon the lever and balance; the tooth escapes, and another drops upon the dead face of the pallet, the pin at the same time passing out of the notch in the other direction, leaving the balance again free. This arrangement is found to give great accuracy and steadiness of performance. To prevent the teeth from slipping away while the balance is free, the faces of the pallets are slightly undercut, and this makes them secure while at rest; moreover, there is a pin on the lever which moves through a notch on the balance disk, while the pin moves through the notch in the lever, which is so adjusted as to guard against the lever moving and the teeth escaping, while the balance is free.

In watches, even more than in clocks, variations of temperature, unless provided for, produce variations in the rate of going, the increase or diminution of the temperature affecting to some extent the moment of inertia of the balance, and to a great extent the elastic force of the balance-spring. A rise in the temperature makes the balance expand, and therefore augments its moment of inertia; it adds to the length of the spring, and thereby diminishes its elasticity, the elastic force of a spring varying inversely as the length; and the time of vibration of the balance, which depends upon the moment of inertia directly, and upon the elastic force of the spring inversely, is increased—the watch, that is, goes more slowly—in consequence both of the increase of the inertia and of the diminution of the elastic force of the spring. A fall in the temperature is attended by opposite results, the watch going more rapidly than before. A watch without a compensated balance would vary very much more than a clock without a compensation pendulum, but that being usually carried in the waistcoat pocket, it is kept at a pretty uniform temperature. To invent a satisfactory compensation was at one time the great problem for watch-makers. The compensation can obviously be made in either of two ways—by an expedient for shortening the effective length of the balance-spring as the temperature rises, so as to increase the elastic force of the spring; or by an expedient for diminishing the moment of inertia of the balance as the temperature rises, so as to correspond to the diminution of the force of the spring. The first method was that made use of by John Harrison (q.v.), who first succeeded in making a chronometer capable of measuring time accurately in different temperatures; but an adaptation of the other method, invented about eighty

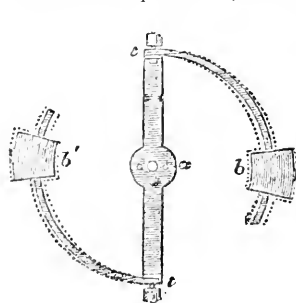


FIG. 2.

years ago by Earnshaw, is that which is always employed now (Fig. 2): $t a t'$ is the main bar of the balance, and $t b, t' b'$ are two compound bars, of which the outer part is of brass and the inner part of steel, carrying weights, b, b' , which may be screwed on at different places. The brass bar expands more with heat, and contracts more with cold than the steel bar; therefore, as the temperature rises, the bars, with their weights, bend inward, and so the moment of inertia of the balance is diminished; as it falls, they bend outward, and the moment of inertia is increased; and of course the diminution or the increase must be made exactly to correspond to the diminution or increase in the force of the spring.

The chronometer is just a large watch fitted with all the contrivances which experience has shown to be conducive to accurate time-keeping—e.g., the cylindrical balance-spring, the detached escapement, and the compensation-balance. As a watch which will keep time in one position will often not do so equally well in another, marine

chronometers are always set horizontally in a box in *gimbals* (q.v.), an arrangement which keeps the chronometer horizontal, whatever the motion of the vessel.

The great importance of an accurate portable time-keeper at sea is for determining the longitude (q.v.). This use was first distinctly pointed out by sir Isaac Newton. A committee of the house of commons, of whom this philosopher formed one, having been appointed on June 11, 1714, to consider the question of encouragement for the invention of means for finding the longitude, the result of their meetings was a memorial containing an explanation of the different means proper for ascertaining the longitude, and recommending encouragement for the construction of chronometers as the best means of ascertaining it. An act of parliament was then passed, offering a reward for this purpose.

The first chronometer used at sea was invented by John Harrison. After many years of study it was completed in 1736. After several further trials and improvements, and two trial voyages to America, undertaken for the satisfaction of the commissioners, the last of which was completed on Sept. 18, 1764, the reward of £20,000 was finally awarded to Harrison.

Somewhat later than this, several excellent chronometers were produced in France by Berthoud and Le Roy, to the latter of whom was awarded the prize by the *académie royale des sciences*. Progress was still made in England by Arnold, Earnshaw (the inventor of the compensation still in use), and Mudge, to whom prizes were awarded by the board of longitude, and under whom a perfection nearly equal to that of the present day was obtained. The subsequent progress of watch-making has been chiefly directed to the construction of pocket-watches on the principle of marine chronometers, or to the combination of accuracy with convenient portability. The adjusted lever watch is now made in Clerkenwell with a degree of accuracy which enables the performance to be warranted within an error of one second a day.

While the compensation of a chronometer can never be made perfectly accurate for all degrees of temperature, there are always two temperatures at which a well-constructed chronometer will go with perfect accuracy. The explanation of this lies in the fact that while the variations of elastic force in the spring go on uniformly in proportion to the rise or fall of the temperature, the inertia of the balance cannot be made to vary as it should do, in exact correspondence to them inversely. The variation of the elastic force may be represented by a straight line inclined at some angle to a straight line divided into degrees of temperature; the corresponding changes of the moment of inertia will be represented by a curve, and this curve can coincide with the straight line representing the variations of elastic force only at two points, corresponding to two different temperatures. The particular points in the case of any chronometer are matter of adjustment. For instance, one chronometer may be made to go accurately in a temperature of 40°, and also in a temperature of 80°, at other temperatures being not so accurate; another chronometer to go accurately at a temperature of 20° and of 60°. It is manifest that the former would be adapted to voyages in a warmer, the latter to voyages in a colder climate. Apparatus for testing chronometers have been long in use in the observatories at Greenwich and Liverpool. In the latter, there is now an extensive apparatus for this purpose, devised by the ingenious astronomer, Mr. Hartnup. In a room which is isolated from noise and changes of temperature, the chronometers are arranged on a frame under a glass case, so contrived that they may be subjected in turn to any given degree of temperature. The rate of each under the different temperatures is observed and noted, and the chronometers registered accordingly. These observations are of the greatest importance both to ship-captains and instrument-makers, who can have their instruments subjected to the observations on payment of a fee.

It may be stated that the main-spring had been employed as the moving force of time-keepers for about a century before the invention of the balance-spring; but very little is known about the action of these forerunners of the watch. A watch without a balance-spring must have been a very rude and untrustworthy contrivance. The honor of first proposing the balance-spring is undoubtedly due to Dr. Hooke, though Huygens and De Hautefeuille also invented it independently much about the same time.—See Denison's *Rudimentary Treatise on Clocks and Watches*; Wood's *Curiosities of Clocks and Watches*; Benson's *Time and Time-tellers* (1875).

WATCH, on shipboard, a division of the crew into two, or if it be a large crew, into three sections; that one set of men may have charge of the vessel while the others rest. The day and night are divided into watches of four hours each, except the period from 4 to 8 p.m., which is divided into two *dog-watches* of two hours' duration each. The object of the dog-watches is to prevent the same men being always on duty at the same hours.

WATCH HILL, the extreme s.w. limit of the state of Rhode Island, in the t. of Westerly; containing several large hotels and a light-house, built of granite, 40 ft. high, showing a fixed white light 62 ft. above the sea. It is a popular summer resort.

WATCHING AND WARDING, in Scotch law, mean the services rendered by one who holds lands under burghage tenure. These services are merely nominal.

WATCH-RATES. In England, are the rates authorized to be levied in a parish or borough under the watching and lighting act, 3 and 4 Will. IV. c. 90, for the purpose of watching and lighting the parish.

WATER (symb. HO .* equiv. 9, spec. grav. 1), in a state of purity, at the ordinary temperature of the air, is a clear, colorless,† transparent liquid, perfectly neutral in its reaction, and devoid of taste or smell. At a temperature below 32° it freezes, crystallizing in various forms derived from the rhombohedron and six-sided prism. See **ICE**; **SNOW**; **FUSING AND FREEZING POINTS**; **HEAT**. It appears from the researches of Arago and Fresnel, that notwithstanding the gradual dilatation of water below 39° , its refractive power on light continues to increase regularly, as though it contracted. Its density at 60° , and at the level of the sea, is taken at 1.000, and forms the standard of comparison for all solids and liquids, hydrogen being similarly taken as the standard of comparison for gases and vapors. Distilled water is 815 times heavier than air; a cubic inch weighs, in air at 62° , with the barometer at 30 inches, 252.458 grains, and *in vacuo*, 252.722 grains, the grain being $\frac{1}{7000}$ of the avoirdupois pound. See **AVOIRDUPOIS**, **GALLON**. For all practical purposes, water may be considered as incompressible; but very accurate experiments have shown that it does yield to a slight extent when the pressure employed is very great; the diminution of volume for each atmosphere of pressure being about 51-millionths of the whole.—See Miller's *Chemical Physics*, 3d ed. p. 41. Water evaporates at all temperatures, and under the ordinary pressure of the atmosphere, boils at 212° , passing off in the form of steam, which, in its state of greatest density at 212° , compared with air at the same temperature, and with an equal elastic force, has a spec. grav. of 0.625. In this condition it may be represented as containing, in every two volumes, two volumes of hydrogen and one volume of oxygen. See **BOILING**, **STEAM**, **VAPOR**.

Water is the most universal solvent with which the chemist is acquainted, and its operations in this respect are equally apparent, although on very different scales, on the surface of the globe and in the laboratory. This solvent action is usually much increased by heat, so that a hot aqueous saturated solution deposits a portion of the dissolved matter on cooling. Some substances are so soluble in water, that they extract its vapor from the atmosphere, and dissolve themselves in it. Moreover, when water is heated in a strong closed vessel to a temperature above that of the ordinary boiling point, 212° , its solvent powers are much increased. Pieces of plate and crown glass, acted upon for four months by water at 300° (in a steam-boiler), were found by the late prof. Turner to be reduced to a white mass of silica, destitute of alkali; while sialacites of siliceous matter, more than an inch in length, hung from the little wire cage which inclosed the glass—an experiment illustrating the action which goes on in the Geyser springs of Iceland, which deposit siliceous sinter. All gases are soluble in water, but water dissolves very unequal quantities of different gases, and very unequal quantities of the same gas at different temperatures. Some gases are so extremely soluble in this fluid, that it is necessary to collect them over mercury. For example, at 32° , 1 volume of water dissolves somewhat less than $\frac{1}{50}$ of its volume of hydrogen, and exactly $\frac{1}{10}$ of its volume of nitrogen, while it dissolves 506 and 1050 volumes of hydrochloric acid and ammonia gases; and while at 32° water dissolves 1.8 times its volume of carbonic acid, it dissolves only half that volume of the gas at 60° .

Water enters into combination with acids, bases, and salts. When an acid has once been allowed to combine with water, the latter can seldom be entirely removed unless by the intervention of a powerful base, which displaces the water, and allows of its removal by heat. For example, if sulphuric acid be largely diluted with water, and exposed to heat, watery vapor alone at first passes off; but as the temperature is raised to about 600° , a point is reached at which acid and water distil over together. The liquid at this stage of concentration is found to be composed of one equivalent of acid and one of water ($\text{HO}.\text{SO}_3$). The further separation of the water can only be effected by the addition of a base, as potash, oxide of lead, etc. Water which, as in this case, supplies the place of a base, is called *basic water*, and the compound is called a *hydrate*, or is said to be *hydrated*. Similarly, water combines with strong bases, such as potash and soda, and heat can only succeed in reducing a mixture of potash and water to a condition represented by one equivalent of each ($\text{HO}.\text{KO}$); and this last equivalent of water can only be removed by the addition of an acid. In this case, the water in combination with the base acts the parts of an *acid*. These compounds also are *hydrates*. In these cases of acids and bases, the one equivalent of water cannot be removed without completely

*During recent years Gerhard's views as to the necessity of doubling the atomic weights of oxygen, carbon, sulphur, and a few other of the elements have been gradually gaining ground. Thus, the combining numbers of oxygen, carbon, and sulphur, instead of being 8, 6, and 16, are now fixed at 16, 12, and 32, and the corresponding symbols are indicated by a horizontal bar, which doubles the value of the symbol.

symbol for an equivalent of water is

H_2O_2 , in place of HO , and the combining number is 18 in

place of 9 (see **CHEMISTRY**).
†Although water is colorless in small bulk, it is blue like the atmosphere when viewed in mass. This is seen in the deep ultramarine tint of the lakes of Switzerland and other Alpine countries, and in the rivers issuing from them; and in the water in the fissures and caverns found in the ice of the glaciers, which, except on the surface, is extremely pure and transparent; and the deep blue tint of the ocean is doubtless due to the water itself, rather than to the salts dissolved in it.

altering the chemical character of the body. (See, for instance, in the article SULPHURIC ACID, the difference between the properties of hydrated sulphuric acid and sulphuric anhydride.) In the case of many salts, however, a certain quantity of the water entering, so to speak, loosely into their composition may be expelled by heat without altering the properties of the salt. The water capable of being thus got rid of is called *water of crystallization*, and is taken up by the salt in the act of crystallizing. The form of the salt depends upon this water of crystallization. In chemical formulae, this variety of water is represented by Aq instead of by HO. For example, in the formula for rhombic phosphate of soda— $2\text{NaO} \cdot \text{HO} \cdot \text{PO}_5 + 24\text{Aq}$ —the HO represents an equivalent of basic water, while 24Aq represents 24 equivalents of water of crystallization.

It is less than a century since the ancient view, that water was one of the four elements, has ceased to be believed in. It is now known that it is a compound of oxygen with hydrogen in the proportion of one equivalent of each. Hence its symbol is HO, and its combining number 9. When converted into vapor, 9 grains of steam occupy the bulk of 8 grains of oxygen at the same temperature; hence the combining volume of aqueous vapor is equal to 2, if the combining volume of oxygen be taken as 1. That water is such a compound as has been just stated may be proved either analytically or synthetically; and the subject is one of so great importance in the history of chemistry, that we shall enter more fully than usual into the consideration of these two modes of proof. The following simple mode of separating water by voltaic electricity into its constituent elements is borrowed from Fownes's *Manual of Chemistry*: "When water is acidulated so as to render it a conductor, and a portion interposed between a pair of platinum plates connected with the extremities of a voltaic apparatus of moderate power, decomposition of the liquid takes place in a very interesting manner; oxygen in a state of perfect purity is evolved from the water in contact with the plate belonging to the copper end of the battery, and hydrogen, equally pure, is disengaged at the plate connected with the zinc extremity, the middle portions of the liquid remaining apparently unaltered. By placing small graduated jars over the platinum-plates, the gases can be collected, and their quantities determined. When this experiment has been continued a sufficient time, it will be found that the volume of the hydrogen is a *very* little above twice that of the oxygen; were it not for the circumstance of oxygen being sensibly more soluble in water than hydrogen, the proportion of two to one by measure would come out exactly." In lecture-rooms, an ingenious but more complicated apparatus, devised by Kopp, is commonly used to illustrate the electrolysis of water. It has been shown by Mr. Grove that an extreme heat may, like electricity, be employed to decompose water into its constituents; and it is well known that if, in the form of steam, it be passed over red-hot iron, it parts with its oxygen to the metal, while the hydrogen is given off as gas. The synthetical proof of the composition of water is afforded by passing pure hydrogen and oxygen, in the ratio of two volumes of the former to one volume of the latter, into a strong glass tube filled with mercury, and exploding the mixture by an electric spark, when the gases are replaced by a corresponding quantity of moisture, and the mercury is forced into the tube so as to fill it. The most satisfactory form of this synthetical proof is, however, afforded by reducing pure oxide of copper at a red heat by hydrogen, and collecting and weighing the water that is thus formed. The apparatus required for this experiment, and the method of employing it, are given in Fownes's *Manual of Chemistry*, 9th ed., p. 131, and in Miller's *Inorganic Chemistry*, 3d ed., p. 52.

Owing to its extremely solvent powers, the *pure water* which we have been hitherto considering is never found in nature. The nearest approach to a natural pure water is *rain-water*, after a continuance of wet weather; but even this water always contains in 100 volumes about 2.5 volumes of atmospheric air, with a trace of ammonia; and in point of fact, it seems impossible to obtain water which does not contain this ingredient, for, after two distillations, professor Miller found from 1.85 to 2.38 volumes of air in 100 volumes of water. In addition to rain-water, the other *natural waters* may be included under the heads of *spring-water*, *mineral waters* (already considered in a special article), *river-water* (see WATER-SUPPLY), and *sea-water* (see below).

This article would be incomplete without a brief notice of the prolonged and acrimonious controversy that was for many years carried on, and is probably now hardly to be regarded as settled, regarding the respective claims of different philosophers to be the true discoverer of the nature and composition of water. In the year 1781, Cavendish made a long and careful series of experiments, which, unfortunately, were not published till Jan., 1784, when his celebrated memoir entitled *Experiments on Air*, was read to the royal society. In the interval (June, 1783), his friend, Dr. Blagden, visited Paris, and on the authority of Cavendish, gave an account of the experiments proving the composition of water to Lavoisier; and this delay between the discovery and the date of publication caused his claims to one of the most marvelous discoveries the world ever saw, to be contested by an English and a French rival, James Watt and Lavoisier. It may be briefly stated, that Cavendish's experiments consisted in exploding, in various proportions, mixtures of hydrogen and atmospheric air, and of hydrogen and oxygen, and finding as the result a liquid which proved to be pure water. (Priestley and his friend, Mr. Warltire, had made similar experiments, and had noticed the deposition of moisture that followed the explosion, but failed to recognize in

it anything but the condensation of aqueous vapors in the gases.) The general conclusion to which Cavendish came was, in his own words, "that water consists of dephlogisticated air united with phlogiston," and as dephlogisticated air was his term for oxygen, and phlogiston his term for hydrogen, this statement corresponds to the modern view of the nature of water introduced by Lavoisier. As Lavoisier was from the first accused by the English chemists of having acted unfairly toward them, and as indeed his own claim only dates back to June 25, 1783, he may be dismissed from further consideration; and during the lives of the English claimants there were no public complaints on either side, although Watt, in private letters to his friends, hinted at Cavendish's incapacity and unfairness. Hence, then—at all events, in this country—scientific men were startled when Arago, then secretary of the French academy, published in 1838 the eulogy of Watt, which he had read as far back as Dec., 1834, in which he charged Cavendish with deceit and plagiarism, inasmuch as he was said to have learned the composition of water, not by experiments of his own, but by obtaining sight of a letter from Watt to Priestley. The battle now fairly began; the first blow being struck in Aug., 1839, when the president of the British association, the rev. Vernon Harcourt, in his opening address, vindicated Cavendish, and pointed out Arago's misstatement*. At a subsequent meeting of the academy, Arago, with Dumas to back him, defended his statements. Sir David Brewster (*Edin. Rev.*, Jan., 1840), then sought to act as mediator; and the controversy, as might have been expected, went on with increased acrimony; and in the summer of the same year, when the president of the British association published the report he had delivered the preceding year, he added a postscript, replying to Arago, Dumas, and lord Brougham (who had appended "An Historical Note on the Discovery of the Theory of Water," to Arago's eulogy). In 1841, Berzelius published what Dr. George Wilson terms "a conditional judgment," in favor of Watt; and in 1845, in his *Lives of Men of Letters* (see *Life of Watt*, p. 400), lord Brougham followed on the same side. Dr. Peacock (*Quart. Rev.*, 1845, p. 105), in reviewing his book, assailed his conclusions, and asserted the claims of Cavendish. In 1846, Mr. Harcourt (*London*, and *Edin. Phil. Mag.*, Feb., 1846), also replied to lord Brougham; and in 1847, in the second edition of his *History of the Inductive Sciences*, Dr. Whewell maintained his old conviction of the claims of Cavendish. In 1846, the publication of the *Correspondence of the late James Watt on his Discovery of the Theory of the Composition of Water*, with an introduction by his kinsman, Mr. Muirhead, who was editor, and a letter from his son, formed a most important addition to the literature of this controversy. Finally, the question was discussed, in 1847, by sir David Brewster in the *North British Review*, and in 1848, by lord Jeffrey in the *Edinburgh Review*, both of whom advocated the claims of Watt. As we have no space to discuss Watt's real claims, we may here state that Dr. George Wilson, whose *Life of Cavendish* is in reality a strictly impartial history of the water controversy, maintains on very sound grounds that in reality Watt was informed of Cavendish's discovery through Priestley, as Lavoisier was through Blagden.

SEA-WATER.—For an accurate knowledge of the composition of sea-water, we are mainly indebted to the investigations of prof. Forchhammer of Copenhagen. Not very many years ago, the only elements known to exist in sea-water, in addition to those constituting water itself, were chlorine, iodine, bromine, sulphur, carbon, sodium, magnesium, potassium, calcium, and iron. To these twelve must now be added (13) fluorine, discovered by Dr. George Wilson; (14) phosphorus, as phosphate of lime; (15) nitrogen, as ammonia; (16) silicon, as silica, in which form it is largely collected by sponges from sea-water; (17) boron, as boric acid; (18) silver; (19) copper; (20) lead; (21) zinc; (22) cobalt; (23) nickel; (24) manganese; (25) aluminium, as alumina; (26) strontium, as strontia; (27) barium, as baryta. Several of these elements, however, exist in such small quantities that they can only be discovered indirectly, that is to say, in sea-weeds, marine animals, or in the stony matter deposited at the bottom of the boilers of oceanic steamers. The substances which, in respect of quantity, play the principal part in the composition of sea-water are chlorine, sulphuric acid, soda, potash, lime, and magnesia; those which occur in less but still determinable quantity, are silica, phosphoric acid, carbonic acid, and oxide of iron. In the elaborate tables which are annexed to this paper, Forchhammer has always calculated the single substances (chlorine, sulphuric acid, magnesia, lime, and potash) and the whole quantity of salt for 1000 parts of sea-water; but besides this, he has calculated the proportion between the different substances determined, referred to chlorine = 100, and of all the salts likewise referred to chlorine. This last number is found if we divide the sum of all the salts found in 1000 parts of any sea-water by the quantity of chlorine found in it; and he terms it the *co-efficient* of that sample of sea-water.* This chemist divides the sea into seventeen regions, his reasons for doing so being that he could thus avoid the prevailing influence which those parts of the ocean which are best known, and from which he has taken most observations, would exert upon the calculations of the mean number for the whole ocean. In reference to the *salinity* of the surface of the ocean, he has made the following observations. (1.) The mean salinity of the Atlantic between 0° and 30° n.

* We give these details because the term *co-efficient* will now doubtless be permanently retained by writers on the chemistry of sea-water.

lat. is 36.169 (i.e., this is the quantity of salts in 1000 parts of water); the maximum, which is also the maximum of the surface-water of the whole Atlantic, being 37.908, and occurring in 24° 13' n. lat., and about 5° w. from the coast of Africa, where no rivers of any size carry water from the land, and where the influence of the dry and hot winds of the Sahara is prevailing. This maximum is equal to the mean salinity of the Mediterranean, and is only exceeded by the maximum of that sea off the Libyan desert, and that of the Red sea. The minimum is 34.283 in 4° 10' s. lat., and 5° 36' w. long., close to the coast of Africa, where the large masses of fresh water which the great rivers of that region pour into the ocean exercise their influence. (2.) In the Atlantic, between 30° n. lat. and a line drawn from the n. point of Scotland to the n. point of Newfoundland, the mean salinity is 35.946, the diminution being due to the fresh water poured into it by the southern mouth of the St. Lawrence. (3.) In the Baffin's bay and Davis's strait region, the mean salinity is 33.281, and the salinity increases from lat. 64° toward the n., being in 64°, 32.926, and in 69°, 33.598. This peculiarity is owing (says Forchhammer) to the powerful current from the Parry islands, which through different sounds passes into Baffin's bay, where it is mixed with the great quantity of fresh water that comes into the sea from the West Greenland glaciers. Had this fact been known before the sounds that connect the Parry archipelago with Baffin's bay were discovered, it might have proved the existence of these sounds, because bays and inlets show quite the reverse; the further we get into them, the less saline the water becomes. (4.) From eleven observations on the Mediterranean between the straits of Gibraltar and the Greek archipelago, he confirms the old view of its great salinity; its mean salinity being 37.936, while that of the whole ocean is 34.388. Its maximum (39.257) falls between the island of Candia and the African shore; and its minimum (36.301) is at the straits of Gibraltar. These results are due to the influence of Africa and its hot and dry winds. In salinity, the Mediterranean is only exceeded by the Red sea, whose mean salinity is 43.067. (5.) The Black sea, like the Baltic, is a mixture of salt and fresh waters. In three different experiments, the salinity varied from 18.146 to 11.880. At a distance of 50 m. from the Bosphorus, the proportions between chlorine, sulphuric acid, lime, and magnesia, were 100 : 11.71 : 4.22 : 12.64, while the normal oceanic proportions are 100 : 11.89 : 2.96 : 11.07; thus shewing a relative increase in the lime and magnesia. (6.) As the Caspian sea is considered by many geologists to have been formerly in connection with the Black sea, the results of Mahner's analysis of its waters are given. The salinity varied between 56.814 and 6.236, and the proportion between the chlorine, sulphuric acid, lime, and magnesia, is 100 : 44.91 : 9.34 : 21.48, which differs extremely from the normal proportion. Thus the Caspian sea, if it ever had any connection with the Black sea, must have entirely changed its character since that time—a change which might be occasioned by the different salts which the rivers brought into it, and which accumulated there by evaporation of the water; or which might be caused by the deposition of different salts in the basin of the Caspian sea itself. (7.) The Atlantic between 30° s. lat. and a line from cape Horn to the cape of Good Hope, is less saline than the corresponding region n. of the equator; and all the samples from the western part of this region have less, while the samples from the eastern part, nearer to the African coast, have considerably more sulphuric acid than the normal quantity. Does this, asks Forchhammer, depend upon the more volcanic nature of the w. coast of Africa than the e. American coast? (8.) In the sea between Africa and the East India islands, the mean salinity is 33.868. The minimum (25.879) is from a place high up in the bay of Bengal, and of course much influenced by the Ganges. It lies, however, about 300 m. from the mouth of that river; and another specimen taken 60 m. nearer the mouth has a salinity of 32.365, so that it would seem as if some other cause (possibly fresh-water springs at the bottom) had been in operation to weaken the sea-water at the minimum spot. (9.) In the Patagonian cold-water current, the mean salinity was 33.966; while three samples brought from the South Polar sea, by the late sir James Ross, had different salinities of 28.565, 15.598, and 37.513. Forchhammer cannot account for these discrepancies. All the specimens showed a great excess of sulphuric acid (12.47 in place of 11.88, as compared with 100 of chlorine), a result probably due to the volcanic nature of the antarctic continent. Forchhammer's analyses of waters from other of his 17 districts call for no remark; and the following are the general results of his investigations. "If we except the North sea, the Kattegat, Sound, and Baltic, the Mediterranean and Black sea, the Caribbean sea and the Red sea, which have all the characters of bays of the great ocean, the mean numbers are the following:

Sea-water.	Chlorine.	Sulphuric-Acid.	Lime.	Magnesia.	All-Salts.	Co-efficient.
1000	18.999	2.258	0.556	2.096	24.404	1.812
	100	11.88	2.93	11.03		
Equivalents,	429	45	16	82		

Thus it is evident that the sea-water, in its totality, is as little a chemical compound as the atmospheric air; that it is composed of solutions of different chemical compounds; that it is neutral, because it everywhere in the atmosphere finds carbonic acid to neutralize its bases, and everywhere on its bottom and shores finds carbonate of lime to neutralize any prevailing strong acid: that, lastly, the great stability of its composition depends upon its enormous mass, and its constant motion, which occasions that any local varia-

tion is evanescent compared to the whole quantity of salt." It will be seen that the Atlantic is that part of the ocean which contains the greatest proportion of salt, while some of the bays in the tropical or subtropical zone (the Mediterranean and Red sea, for example) have a greater mean than the Atlantic; that on approaching the shores, the sea-water, as might have been expected, becomes more diluted, and consequently less saline; that the polar currents contain less salt than the equatorial; that the polar current of west Greenland contains more sulphuric acid than the water in any other region except the east Greenland and south polar currents (while in the ocean at large the chlorine is to the sulphuric acid as 100 : 11.89; in the south polar current it is as 100 : 12.55). As in the case of the west Greenland current, there is no neighboring volcanic region to account for this excess. Forchhammer suggests that the absence of fucoid plants, which have a great attraction for sulphuric acid, may have an influence in bringing about this result,* that most lime occurs in the ocean in the second region, the middle part of the northern Atlantic; and the least in the west Greenland polar current (the quantities being 3.07 and 2.77 respectively). Wherever, in other regions, the influence of land prevails, the lime also is in excess; thus, in the Black sea, it was 4.221.

From these remarks on the *surface-water*, we pass on briefly to notice the difference of sea-water in *different depths*. On this subject, the result obtained from the analyses of specimens of sea-water taken from different regions, is so contradictory that we shall simply quote the sentence with which Forchhammer commences this department of his subject: "It would be natural to suppose that the quantity of salts in sea-water would increase with the depth, as it seems quite reasonable that the specific gravity of sea-water would cause such an arrangement. But this difference in specific gravity, relative to the increase in the quantity of salts, is counteracted by the decreasing temperature from the surface to the bottom. We have parts of the sea where the quantity of solid salts increases with the depth; in other parts, it decreases with the increasing depth; in other places, hardly any differences can be found between surface and depth; and, lastly, I have found one instance where water of a certain depth contained more salt than both above and below. These differences are, to a great extent, dependent upon currents both on the surface and in different depths."—*Op. cit.*, p. 229. Sometimes salinity of the surface-water is the same as that of the deep; or one or more ingredients may vary in its proportions: for example, in the Mediterranean, while the deep water, generally, is richer than the surface-water in sulphuric acid, in some parts, as between Sardinia and Naples, the surface-water is the richer in that ingredient. There are few observations on the specific gravity of sea-water at different depths. For the following observations we are indebted to sir James Ross: "At 39° 16' s. lat., 177° 2' w. long., the specific gravity of the surface-water was 1.0274; at 150 fathoms, 1.0272; and at 450 fathoms, 1.0268; all tried at the temperature of 60° Fahr., and showing that the water beneath was specifically lighter than that of the surface, when brought to the same temperature; our almost daily experience confirmed these results."—*Voyage*, etc., vol. ii. p. 133.

The important question, How did the salts which now occur in the sea come into it? Is it the land that forms the sea, or is it the sea that makes the land? Are the salts that are now found in sea-water washed out of the land by the atmospheric water? Has the sea existed from the beginning of the earth? And has it slowly but continually given its elements to form the land? and their answers constitute the last part of Forchhammer's most philosophical and laborious Memoir. The following is, in a condensed form, his reply to these questions: Suppose a river had its outlet in a valley, with no communication with the sea; the valley would be filled with water till its surface was so great that the annual evaporation was equal to the annual supply. There would then be a physical, but not a chemical equilibrium, because the annual loss would consist of pure water, while the received water would contain various mineral or saline matters, which would go on increasing till chemical changes would occasion precipitation of different salts. Now, in the water of the assumed river, we should find the bases prevailing in the following order—lime, magnesia, soda, iron, manganese, and potash; while the acids, similarly arranged, were carbonic, sulphuric, muriatic (chlorine), and silicic. Now, all these substances are found in sea-water, although in very different proportions. The ocean is, in point of fact, such a lake as we have here supposed, with all the rivers carrying their dissolved matters into it. "Why, then," our author asks, "do we not observe, a greater influence of the rivers? Why does not lime, the prevailing base of river-water, occur in a greater proportion in the water of the ocean?" In all river-water the number of equivalents of sulphuric acid is much smaller than that of lime, and yet we find in sea-water about three equivalents of sulphuric acid to one of lime. There must thus be in sea-water a constantly acting cause that deprives it again of the lime

* In a paper read before the British association in 1844, Forchhammer showed that the fucus tribe has a great attraction for sulphuric acid, and that the acid, when the plant undergoes putrefaction, is reduced to soluble sulphides and to sulphureted hydrogen, which, with the oxide of the iron of the plant, which is partly dissolved and partly suspended, will form sulphide of iron. Thus the sulphur will disappear from the water. He suggests that the diminution of sulphuric acid which he found in the Atlantic, between the equator and 30° n. lat. (11.75 in place of 11.89), may be due to the action of the Sargasso sea.

which the rivers furnish, and we find it in the shell-fishes, the corals, the bryozoa, and all the other animals which deposit carbonate of lime." These animals not only deprive the water of its carbonate of lime, but they likewise decompose the sulphate of lime—a decomposition probably depending upon the carbonate of ammonia formed by the vital processes of these animals. The silica, which is always present in river-water, is appropriated by the varied sponges, diatoms, etc., and hence its scantiness in sea-water. With regard to the sulphuric acid conveyed into the sea, a small part enters into the composition of shells, corals, etc., and a greater part is attracted by sea-weeds, in which it undergoes reduction, as already described, while the balance remains in the sea-water. The magnesia of the river-water enters in small quantity into marine shells and corals, but only a small quantity is thus abstracted from sea-water, while the soda and muriatic acid, or chlorine, form, as far as we know, by the pure chemical, or organo-chemical action that takes place in the sea, no insoluble compound. "Thus," he concludes, "the quantity of the different elements in sea-water is not proportional to the quantity of elements which river-water pours into the sea, but inversely to the facility with which the elements in sea-water are made insoluble by general chemical or organo-chemical actions in the sea; and we may infer that the chemical composition of the water of the ocean in a great part is owing to the influence general and organo-chemical decomposition has upon it, whatever may have been the composition of the primitive ocean."

WATER-BED. called also the **HYDROSTATIC BED**, or **FLOATING MATTRESS**. It is well known that the life and health of every part of the animal body depend on the sufficient circulation through them of refreshed blood. See **CIRCULATION**. Now, when a person in health is sitting or lying, the parts of the flesh compressed by the weight of the body do not receive the blood so copiously as at other times; and if from any cause the action of the heart has become weak, the interruption will follow both more quickly and be more complete. A peculiar uneasiness soon arises where the circulation is thus obstructed, impelling to change of position: and the change is made as regularly and with as little reflection as the winking of the eyes to wipe and moisten the eyeballs. A person weakened by disease, however, while generally feeling the uneasiness sooner, as explained above, and becoming restless, makes the changes with increasing fatigue; and should the sensations become indistinct, as in the delirium of fever, in palsy, etc., or should the patient have become too weak to obey the sensation, the compressed parts are kept so long without their natural supply of blood that they lose their vitality, and become what are called sloughs or mortified parts. These, if the patient survives, have afterward to be thrown off by the process of ulceration, leaving deep hollows to be filled up by new flesh during a tedious convalescence. Many a fever or other disease, after a favorable crisis, has terminated fatally from this occurrence of sloughing on the back or sacrum. The same termination is common in lingering consumptions, palsies, spine diseases, etc., and generally in diseases that confine the patient long to bed.

It was to mitigate all, and entirely to prevent most of the evils attendant on the necessity of remaining long in a recumbent posture, that the hydrostatic bed was devised by Dr. Neil Arnott, late one of the queen's physicians. The bed may be shortly described as a mattress floating on water, with a loose sheet of caoutchouc cloth properly secured between it and the water, to prevent its being wetted. A person rests on it as a water-fowl does on its bulky feathers, with as little inequality of local pressure as if in a bath. A trough of the dimensions of a wide sofa or a bed, having 6 or 7 in. depth of water in it, with the required caoutchouc covering, is the foundation, on which clothes and pillows are laid as in a common bed. A full description is given in Dr. Arnott's book, the *Elements of Physics* (6th edition, Longman & Co.). The bed not only prevents the occurrence of bed-sores, but by lessening antecedent distress lessens also the danger of the illness.

On a sudden emergency, or when the need of the fluid support is not very urgent, local relief may be given by forming in any way a partial hollow or depression in a bed, and placing in it a water-sack or bag half-filled, so as to remain loose or slack. This approaches in effect the slack-sided cushion, which is another modification of the invention.

WATERBRASH. See **PYROSIS**.

WATER-BUDGET, a heraldic bearing in the form of a yoke with two pouches of leather appended to it, originally intended to represent the bags used by the crusaders to convey water across the desert, which were slung on a pole, and carried across the shoulders. The Trusbuts, barons of Wartre in Holderness, bore *Trois bontz d'eau*, three water-budgets, symbolizing at once their family name and baronial estate; and by the marriage of the heiress, similar arms came to be assumed by the family of De Ros, who bear gules, three water-budgets argent.

WATER-BUG, the popular name of a tribe or section of heteropterous insects, *hydrocorisæ*, which live almost entirely in water, and feed upon other aquatic insects. The anterior portion of the first pair of wings is horny; the antennæ are very small, and concealed beneath the eyes. The *hydrocorisæ* are divided into two families, *notonectidæ*, and *nepidæ*. Of the former, the boat-fly (q.v.) is an example. The *nepidæ* are popularly known as **WATER SCORPIONS**, from the form of their fore-legs, which are efficient

instruments for seizing their prey. Some of the *nepidæ* are powerful insects, two or three inches long.

WATERBURY, a township and city of New Haven co., Conn., 33 m. s.w. of Hartford, on the left bank of the Naugatuck river, at its confluence with Great Brook and Mad river, whose falls furnish abundant water-power. It is a well-built town, with a fine park and ornamental cemetery, 7 churches, 2 banks, and 30 large manufactories of rolled copper, brass, German-silver, plated ware, pins, hooks and eyes, buttons, lamps, clocks, percussion-caps, etc. It has been built up by small mechanics, and is the headquarters of the brass business in the United States. Pop. '70, 10,826.

WATER CALTROPS. See TRAPA.

WATER CHESTNUT, *Marron d'eau* the name given in France to the edible seeds of the *trapa natans* (see TRAPA).—The name water chestnut is also given to the edible tubers of the *scirpus tuberosus*, a plant of the natural order *cyperaceæ* (see BULRUSH and CYPERACEÆ), which is cultivated by the Chinese in tanks very abundantly supplied with manure. It is destitute of leaves, except a slender short sheath or two at the base of each culm. It is stoloniferous, and the tubers are produced on the stolons. They are in high estimation among the Chinese, both for food and as a medicine, and are eaten either raw or boiled. They are called *pi tsi* or *maatai*.

WATER-COLOR PAINTING, in some of its forms, was employed from the most ancient times until the middle ages, when oil was sometimes added to the gum, with which the colors were prepared. About 1410 the brothers Van Eyck, at Ghent, made improvements in the use of oil-colors, which entitle them to be called the initiators of the modern school of oil-painters. In the method known as *distemper*, the pigments are ground up with size and water, or with gum-water. In ancient Egyptian paintings the colors, mixed with gum and water, were sometimes laid immediately on stone walls, sometimes on a coating of plaster, on wood, and baked or wet clay. The Greeks mixed their colors with gum, the yoke and white of eggs, and water. Sometimes, it is said, milk also was added. The gum was used to make the paint adhere after the water had evaporated. Until 1410 the Italian artists employed the distemper of the ancients; and afterward they still used it in fresco-painting. Michael Angelo employed it in his greatest works, and thought oil-painting unworthy of a true artist. Most artists of that day painted their easel pictures in oil, and their frescos in distemper. In the true fresco the colors, mixed with water, are applied directly to the smooth wet surface of good lime mortar, when a crystalline surface is formed, which almost excludes water. In dry fresco, the plaster, having first dried thoroughly, the artist moistens again as large a part of it as he can cover with color at a single sitting. Societies of artists in water-color pictures on paper now hold a distinguished place among the various schools of painting. In New York the annual exhibitions show a great advance in excellence and variety of work.

WATER-COLORS are painters' colors mixed with water and some adhesive material, as gum or size, instead of oil. Those intended for drawings on paper are prepared with great care, and are usually formed into dry cakes with gum. Those for coloring walls and scene-painting are roughly prepared with glue or size. These are often called distemper colors, from the Italian term *tempera*, applied to them to express their application to temporary purposes.

WATERCOURSE, in law, means a stream flowing naturally and constantly between ascertained banks. Ownership in a watercourse is included under the name land; and a conveyance of land vests in the grantee not only the land strictly so-called, but all the streams crossing the surface of the land. In case of a division of two estates by a watercourse, the estate of each proprietor is bounded by the central line of the stream. Proprietors of land adjoining a watercourse are called riparians. All owners of lands through which water flows have the same rights, a usufruct in the water, to a reasonable use of which every riparian proprietor is entitled; but one is not allowed to flow it back upon the proprietor above him, or to flood the proprietor below. A navigable watercourse, if it lie entirely within the limits of a state, is subject to the authority of the state government. A navigable river, flowing between two or more states, is subject to the right of congress to regulate commerce between the states. The proprietors of land lying along a navigable watercourse are not owners of its bed.

WATER-CRESS. See CRESS.

WATER-CURE. See HYDROPATHY, *ante*.

WATER-DOG, a kind of dog, of which the poodle (q.v.) is regarded as a sub-variety. The head is rather large and round, the ears long, the legs rather short, the general form compact, the hair everywhere long and curly. The water-dog of England, common before the poodle had been introduced from the continent, is still much esteemed by professional wild-fowl shooters, and by the fishermen of the north-eastern counties. It is about 18 or 20 in. high at the shoulder. The hair is coarser and crisper than that of the poodle. This dog was formerly sometimes used in London for the brutal sport of hunting and worrying domestic ducks, placed in a pond for the purpose. It is an intelligent and affectionate kind of dog, although not of much beauty.

WATER-DROPWORT, *Oenanthe*, a genus of plants of the natural order *umbellifereæ*; having ovato-cylindrical fruit, not prickly nor beaked, each carpel with 5 blunt convex ribs, and single vittæ in the interstices; the calyx teeth lanceolate; the petals obovate and radiant, with an inflexed point; the partial involucre of many rays; the flowers of the circumference on long stalks and sterile, those of the center subsessile and fertile. A number of species are natives of Britain—large perennial plants, with a strong and generally disagreeable aromatic smell, and compound or decomposed leaves. The COMMON WATER-DROPWORT (*O. fistulosa*) and the HEMLOCK WATER-DROPWORT, or WATER HEMLOCK (*O. crocata*), are both common in wet places in Britain and throughout Europe, and both are narcotic acrid poisons. The roots of the latter have some resemblance to small parsnips, and hence fatal accidents have frequently occurred. The FINE-LEAVED WATER-DROPWORT, called water fennel by the Germans (*O. phellandrium*, formerly known as *phellandrium aquaticum*), is also common in ditches and ponds both in Britain and on the continent. It has a jointed root-stalk (*rhizome*), with tufted whorled fibers and a strong zigzag stem dilated at the base. The leaves are decomposed. The fruit has a peculiar aromatic but disagreeable smell. It is not so poisonous as the other species just named. It was at one time erroneously regarded as a specific against pulmonary consumption; but it has been advantageously employed in pulmonary complaints.

WATEREE, a river of the United States, formed by the junction of the Catawba and Fishing creek in North Carolina, runs s.e. into South Carolina, where it unites with the Congaru to form the Santee. Steam-boats ascend the Wateree to Camden, 200 m. from the sea.

WATERFALL is a break in the continuity of slope of the channel of a river or stream, so abrupt that the body of water *falls* from the higher to the lower level. Waterfalls occur most frequently in mountainous countries, where the streams from the mountainsides enter the valleys. It is only when the side of the valley is composed of hard rock that there can be a waterfall; in friable strata the stream wears out a ravine or side-valley. These mountain waterfalls, however, are generally rather curious and picturesque than grand, the volume of water being in most cases comparatively insignificant, though the height of fall is occasionally very great. All mountain waterfalls necessarily change their aspect from season to season—in winter, a roaring torrent plunging headlong into the abyss; in summer, often a mere film of water trickling down the face of the precipice. Waterfalls in comparatively level districts are not nearly so common, and their height of fall is insignificant compared with that of mountain cataracts; but the much greater volume of water, its steady and even flow to the head of the precipice over which, in solid column, it descends with a thundering plunge, place such waterfalls among the grandest of nature's phenomena. It is where the course of a large river passes from a higher to a lower plateau, and where the upper plateau is edged with rock, that the grander cataracts are formed. If the rocks are of the same hardness from top to bottom, the edge of the escarpment, supposing it to be perpendicular at first, becomes worn off, and a slope or *rapid* is formed. But when the upper edge is hard and the under strata soft and friable, the reverberation of the spray wears away the softer parts below, leaving a projecting ledge at the top, which breaks off, piece by piece, as it becomes too much undermined, so that the fall is constantly receding. The question of the rate of regression of waterfalls has not hitherto occupied much attention, and has only been estimated in the case of Niagara, Bakewell giving its annual value at one yard, while Lyell limits it to about a third of this. Some of the most remarkable waterfalls of the world are the Yosemite, California, in a valley of the same name; a fall 2,550 ft. in entire height, but broken into three leaps; the Orco falls at Monte Rosa, 2,400 ft.; Gavarnie (Pyrenees), 1400 ft.; Staubbach (Switzerland), 1000 ft.; Maanelvan (Norway), 940 ft.; Niagara (q.v.); Zambezi (q.v.); Missouri; the great Kaieteur fall in British Demerara, over 700 ft. The cataracts of the Velino and Anio, in Italy, are beautiful artificial imitations.

WATER FLEA, *Daphnia*, a genus of *entomostraca*, of the order *cladocera*, and family *daphniade*. One species, *D. monoculus*, is abundant in pools and ditches in Britain. It comes to the surface in the mornings and evenings, but keeps near the bottom during the heat of the day. It swims by taking short springs, whence its popular name. It feeds on minute particles both of animal and vegetable substances. It is a beautiful object for the microscope; the whole interior organization being visible through the transparent carapace. The male is much smaller than the female, and comparatively rare. The eggs, after leaving the ovary, are retained in a cavity between the body and the carapace, until the young have attained almost their perfect form.

WATERFORD, a maritime co. of the province of Munster, Ireland, is bounded on the n. by the counties of Tipperary and Kilkenny, on the e. by Wexford, on the s. by the Atlantic, and on the w. by the county of Cork. Its greatest length from e. to w. is 52 m., and its breadth, n. to s., 28; the total area being 721 sq.m., or 461,563 acres, of which 335,345 are arable, 105,496 waste, 23,468 in plantations, 526 in towns, and 5,579 under water. The pop. in '51 was 164,051; in '61, 134,252; and in '71, 123,310, of whom 116,829 were Roman Catholics, and 5,090 Protestant Episcopalians. In 1878, there were about 12,000 pupils on the rolls of the national schools. The number of acres under crops of all kinds in 1878 was 90,581, oats being the principal crop. The live-

stock in 1878 comprised 13,948 horses, 93,732 cattle, 56,724 sheep, and 53,325 pigs. The fishing-grounds on the coast, once thought inexhaustible, are now said to be unproductive. The coast line extends from the estuary of the Suir, Waterford harbor, to that of the Blackwater at Youghal, and is partly flat, partly rocky, but in general very dangerous for shipping. The rocky district contains some remarkable caverns. The surface is in general mountainous; the principal ranges being Knockmeledown, the Cummeragh, Monevolagh, and Drum. The Cummeragh mountains are the loftiest, and abound in wild and picturesque scenery. The Suir (q.v.) and the Blackwater (q.v.) are the chief rivers. There are no lakes worthy of note. The climate is moist, and the soil, over a considerable part of the county, is marshy; but the upland districts are well suited for tillage, and the lower pasture-lands, although inferior in fattening properties to those of the great central plain, produce excellent butter, which is exported in large quantities. In geological structure, the mountains present the old and new slate, separated by red and gray quartz rock and quartzose slate. Of quarry slate, there are two principal varieties, which are raised extensively for local use. The valleys belong to the limestone series, being an outlying prolongation of the great bed of the central plain. Lead, iron, and copper are found. The former two have proved unprofitable, but the copper-works at Bonmahon and Knockmahon have for many years been very productive. Marble of several colors and of considerable beauty is quarried near Cappoquin and Whitechurch, and potter's clay of good quality is found at Kildrum, near Dungarvan. The chief occupations of the population are pasturage and dairy farming; but a considerable manufacture both of cotton and linen has been recently introduced at Portlaw, and the shipping-trade has of late years become active and profitable.

Waterford is divided into eight baronies. The most considerable towns besides Waterford city (q.v.) are Dungarvan, Carrick-beg—properly a suburb of Carrick-on-Suir, which is in Tipperary—Lismore, Cappoquin, Tallow, and Tramore. Clonmel, although chiefly in Tipperary, lies partly within this county. Waterford returns five members to parliament—two for the county, two for Waterford city, and one for the borough of Dungarvan. The county constituency in 1878-79 was 3,223. The net annual value of property in the county, with the city, is £316,685. This district, in common with the adjoining county of Wexford, is believed to have been anciently peopled by a Belgic colony. The Danes also formed a settlement at the mouth of the Suir. From the date of the invasion, Waterford became a stronghold of the English, large grants having been made by Henry II. to the family of Le Poer; and in all the alternations of the subsequent struggle with the Irish population, it continued for the most part a firm center of English influence. The county abounds with antiquities, ecclesiastical and military, and of the Celtic and Danish, as well as the Anglo-Norman period.

WATERFORD, a t. in n.w. N. Y.; incorporated 1801; set off from the t. of Half-Moon, 1816; laid out in 1784 as Half-Moon Point, in the co. of Saratoga; pop. '80, 4,326. It is bounded on the s.w. by the Mohawk river, and is on the w. bank of the Hudson river, 10 m. n.e. of Albany. It is on the Rensselaer and Saratoga railroad; the river is navigable to this point, and the Champlain canal passes through, with locks for conveying boats into the river. It is connected with Lansingburgh by a bridge, with lake Champlain by the state canal, and with Troy, 3 m. distant, by horse-cars. The falls of the Mohawk are made available for manufacturing purposes by a hydraulic canal $\frac{1}{2}$ m. long, constructed in 1828-29. It contains a fire department, and has manufactories of iron, nuts, and valves, hay-presses, lampblack, cement sewer-pipes, straw board, paper, a veneer sawing-mill, a fire-engine factory, etc.; the establishments employing a capital of \$3,000,000. It contains 6 churches, a bank, and a newspaper.

WATERFORD, a city, capital of the co. of the same name, but itself a co. of a city, and a parliamentary borough, is situated in n. lat. 52° 16', w. long. 7° 8', on the river Suir, 12 m. from the sea, and 97 s.s.w. from Dublin, with which city it is connected by the Great Southern and Western, and Waterford and Limerick Junction railways, as also by the Waterford and Kilkenny railway. The pop. in '61 was 23,293, of whom 20,429 were Roman Catholics, and 1969 Episcopalians of the Protestant church; and in '71, 23,349, of whom 20,604 were Roman Catholics, and 1861 Protestant Episcopalians. Eight newspapers are published in Waterford. The city, with the exception of an inconsiderable suburb, with which it is connected by a bridge of 39 arches, 852 ft. long, opening for the passage of ships, lies on the right bank of the Suir, along which a handsome and spacious quay extends for a distance of nearly a mile, and from which the city ascends gradually in well-built streets. Vessels of 2,000 tons are now enabled to discharge their cargoes at the quay; but there is an anchorage for still larger ships about 6 m. lower down the river, at Passage. The chief public buildings are the Protestant and Roman Catholic cathedrals, the Protestant Episcopal palace, the (Catholic) college of St. John, the model national school, and the city and county court-houses. In addition to the union workhouse, there is an infirmary, a dispensary, a fever hospital, a district lunatic asylum, and a penitentiary. The affairs of the municipality are administered by a mayor and corporation consisting of 10 aldermen and 30 councilors; those of the port, by a body of commissioners, 24 in number, elected by the corporation and the chamber of commerce. The chief trade is with England, in the export of butter, pork, bacon, corn, flour, eggs, and live stock. The annual value of property under the val-

uation act is (1879) £53,214. Steam-navigation has received a great impulse, and there is now a ship-building yard, with patent slip, graving-bank, and dock, on the Kilkenny bank of the river.

Waterford is originally of Danish foundation; but at the invasion, the city was taken by assault by Strongbow, by whom it was enlarged, and made a place of strength. It received a charter from John, which was forfeited under James I., but restored by Charles I. in 1626. But few remains of its ancient buildings are now to be seen.

WATER-GAS, a term first applied to hydrogen on account of its being the gas which was liberated when steam was brought into contact with red-hot iron; the oxygen of the steam uniting with the iron, forming oxide of iron, while the hydrogen was evolved. Subsequently it was discovered that, when carbon was employed in place of iron, there was not only hydrogen liberated, but oxide of carbon, which is also a gas; it was then found that, if this mixture of hydrogen and oxide of carbon was enriched by the addition of naphtha, etc., it would make an illuminating gas; but so far as known, there was no practical application made of this fact till 1830, when Michael Donovan patented a process for the manufacture of an illuminating gas composed of hydrogen and oxide of carbon, enriched to give it illuminating power, which was called water-gas, and was essentially the same as is now manufactured under that name. A Belgian by the name of Jobard obtained a patent for water-gas in 1832; and later, George Lowe, an English engineer, also obtained a patent. M. Selligne, of Paris, employed three iron retorts for making water-gas, two of which contained charcoal, while the third was two-thirds filled with red-hot iron chains, upon which a slow stream of shale oil was allowed to flow. Steam was passed into the first retort, where it was decomposed; from thence into the second, where the red-hot charcoal converted any CO_2 (carbonic acid) into CO (carbonic oxide). The gases then passed into the third retort containing the red-hot chains upon which the "shale oil" was flowing and being vaporized, thereby imparting to the gases illuminating properties. Later, Mr. Kirkham, an English engineer, took hold of the process, and, in 1852, it was patented in England by Messrs. John and Thomas Kirkham. An attempt was then made to introduce it into England, but without much success. It was then taken to Paris and there created considerable excitement, and was about to be extensively introduced, when, by some misunderstanding in regard to its poisonous properties, it was abandoned. In 1871 there was introduced into this country a process called after its inventor, Tesse du Motay; it is now in use by the municipal and New York gas-light companies in New York city. Water-gas, before being enriched, has a specific gravity of about one-half that of air; it has a strong odor, and burns with an almost non-luminous flame, producing an intense heat. It consists of about equal parts of hydrogen and carbonic oxide, some marsh gas, and a small percentage of carbonic acid, sulphur compounds, and any volatile impurities in the coal. After being enriched and purified it still has a strong odor and a gravity of about .66 compared with air. Its illuminating power is from 25 to 30 candles. It requires less oxygen to burn it, but will not explode as quickly as coal gas, and when exploded exerts less shock, as is shown by windows being blown out without breaking the glass. The fact that it can be produced with rapidity from smaller apparatus, and, as is claimed, more economically than coal gas, seems to indicate for it an extended use in the future.

WATER-GLASS, the soluble silicates of potash or soda, or a mixture of both. It is usually prepared by boiling silica with caustic alkali under pressure, about 60 lbs. to the square inch, in a digester. When pure and solid, it has the appearance of common glass, and is slowly soluble in boiling water. A solution of water-glass is used, mixed with sand, etc., to form artificial stone. It is also spread on the surface of stone to protect it from decay, as it sinks in and cements the particles together; and it enters into the composition of some kinds of cement. In the art of stereochromy, or fresco-painting (q.v.), water-glass is now much used. It has also become useful in certain dyeing processes, having in some cases been found to answer the purpose of dunging.

WATER-HEN. See GALLINULE.

WATERHOUSE, BENJAMIN, 1754-1846; b. R. I.; educated at London, Edinburgh, and the university of Leyden. He was professor of theory and practice of medicine in Harvard university, 1783-1812; was appointed U. S. hospital surgeon in 1812, and was post-surgeon, 1818-21. He delivered the first course of lectures on natural history ever given in this country, into which he introduced the study of mineralogy. He secured the foundation of the Cambridge botanic garden. He defended Jenner's discovery of vaccination, and wrote several books.

WATERLAND, DANIEL, D.D., a clergyman of the English church, prominent in the theological controversies of the first half of the 18th century. He was born on Feb. 17, 1683, at Waseley in Lincolnshire, of which parish his father was the rector. After going through the usual course of study at Magdalen college, Cambridge, he was admitted into orders; and in 1713 he became rector of Ellingham on the nomination of the earl of Suffolk. It was shortly after this that he published his first book, *Advice to a Young Student, with a Method of Study for the first Four Years*—an unpretentious but useful work, which soon became very popular, and brought its author into notice. King George I. appointed him one of his chaplains in 1717. About this period he began

to be engaged in theological controversy, one of his earliest works being a criticism of a book by Dr. Whitby, in which a severe attack was made upon bishop Bull's *Defence of the Nicene Creed*. Whitby answered him; Waterhouse rejoined; and in 1719 the latter expanded his writings upon this subject into his *Defence of Christ's Divinity*. This work was sharply criticised by Dr. Clarke and other Arians; to whom Waterland replied in a work published in 1724. Upon the same subject he, in 1720, preached and published a series of sermons at the request of the bishop of London. Within a few years after this he passed through a rapid course of promotion in the church. In 1721 he was appointed rector of the parish of St. Augustine in the city of London; in 1724 he got the chancellorship of the cathedral of York. He was appointed a canon of Windsor in 1727, and archdeacon of Middlesex in 1728. He held along with the latter appointments the valuable living of Twickenham. During these years he was indefatigable in controversy; not only keeping up a paper war against the Arians, but entering the lists against free-thinkers, such as Middleton and Tindal, and against those of the Anglican body who did not share his doctrines upon the subject of the Trinity and the eucharist. A *Critical History of the Athanasian Creed* (1724); A *Review of the Doctrine of the Eucharist* (1747); and *Scripture Vindicated* (1734), are considered among the most noteworthy of his productions. In 1738 were published two volumes of his sermons, edited by one of his friends—the one upon Justification, the other upon the Communion of Infants. Waterland died on Dec. 23, 1740. A complete edition of his works, accompanied by a pretty full memoir of his life from the pen of bishop Van Mildert, was published at Oxford in 1823, in ten vols. 8vo; an eleventh vol. containing a general index, was added in 1828.

WATER LILY, a name commonly enough given to the different species of *nymphaea* and *nuphar*, and also of *ubumbium*, all genera of the natural order *nymphaeaceae* (q.v.), and in indeed often extended to all the plants of that order. Britain produces three species—*nymphaea alba*, the white water-lily; and *nuphar luteum* and *nuphar pumilum*, called yellow water-lilies. The two former are frequent in still waters in most parts of the island; *nuphar pumilum* is more rare, and chiefly found in Scotland. All have heart-shaped leaves, floating on the water. The beautiful and fragrant white flowers of *nymphaea alba* float upon the water; the flowers of the yellow water-lily, which are of comparatively little beauty, are raised by their stalks a little above it. The seeds of these, as well as of the water-lily of the Nile, (*nymphaea lotus*—see LOTUS), are farinaceous, and are sometimes used for food. The Turks prepare a cooling drink from the stems of *nuphar luteum*.—The SWEET-SCENTED WATER-LILY of North America, *nymphaea odorata*, has a large white flower of great beauty, and of very sweet smell. Not only *nymphaea lotus*, but also *N. rubra* and *N. pubescens*, are regarded as sacred plants by the Hindus. *N. cerulea* was also held sacred by the ancient Egyptians.

WATERLOO, a co. in central Ontario, drained by the Grand river; 530 sq.m.; pop. '71, 40,251. Co. seat, Berlin.

WATERLOO, a city and co. seat of Black Hawk co., Iowa, on Cedar river; a station on the Burlington, Cedar Rapids and Northern, and the Iowa division of the Illinois Central railroads; pop. '70, 5,508. Cedar river furnishes abundant water-power, and there are manufactories of woolen goods, farming implements and furniture, 9 elevators, 2 flour-mills, 2 foundries, 3 banks, and 3 newspapers.

WATERLOO', BATTLE OF, the decisive conflict which annihilated the power of Napoleon I., was fought June 18, 1815, in a plain about 2 m. from the village of Waterloo, and 12 m. s. from Brussels. Agreeably to the unanimous resolve of the allies to attack Napoleon on all sides, and crush him as they had done in 1814, British and Prussian troops were stationed in the Netherlands, under the command of Wellington and Blücher respectively, in order to attack France on the north. Napoleon, on his side, well aware that for a considerable time no weighty attack could be made on France except by these forces, and fully recognizing the immense advantage to be gained by destroying one enemy before the others could come up, rapidly concentrated the bulk of his troops; and with a suddenness and secrecy which defied all effective counter-preparations, crossed the Belgian frontier, and fell with one part of his forces on the Prussians at Ligny (q.v.), and with the other part, under Ney's immediate command, on the army of the prince of Orange at Quatre-Bras (q.v.). The Prussians—as Wellington, after learning Blücher's dispositions for the battle, had foretold—were, after a contest of the most obstinate description, completely defeated; but the prince of Orange, by the aid of the re-enforcements promptly forwarded to him by the English commander, succeeded in withstanding Ney's attack. In the plan preconceived by the allied generals such a result was not unforeseen, and in accordance with their scheme of firm resistance and retreat if necessary (to allow time for the Russians and Austrians to assemble on the eastern frontier of France), Blücher retreated northward (instead of eastward, as Napoleon expected, nearer the place of rendezvous with Wellington at Mont St. Jean; while early on the morning of the 17th, the Anglo-Netherlanders retired along an almost parallel route till they reached the forest of Soignies, in front of which they were formed in battle-array, facing southward. Napoleon, imagining that the Prussians were in total rout, and that their complete dissipation would easily be accomplished by Grouchy's division (33,000 men), which he had sent in pursuit, crossed to Quatre-Bras

with the rest of his troops, and uniting with Ney, marched in pursuit of Wellington, arriving on the plain of Waterloo in the evening.

The two armies which then confronted each other, though nearly equal in strength, were composed of very different materials. The French army, numbering from 69,909 to 72,247 men (according to French authorities, English historians varying in their estimate from 74,000 to 90,000, though its exact strength cannot be ascertained, owing to the loss of the official returns), was composed of veteran troops, who had enthusiastically ranked themselves once more under the standard of the chief who had so often led them to victory. The Anglo-Netherlands army, which numbered 69,894, of whom only 25,389 were British, 6,793 of the king's German legion, 10,995 Hanoverians, 6,303 Brunswickers, 2,926 Nassauers, and 17,488 Netherlanders, consisted, with the exception of a small number of Peninsula veterans, wholly of young soldiers, a large proportion of whom had never been under fire; the Hanoverians were only militia, some of them being fit but for garrison duty: while the behavior of many of the Belgian troops during the battle showed plainly enough that they mainly increased the *numerical* strength of the army, as they left it to the Dutch soldiers to vindicate the wrongs of the Netherlands. The French had 240, while their opponents had only about 156 guns. With such an army, to maintain even a defensive conflict with an army of veterans, commanded by the greatest gen. of the time, was a task which (laboring under a mistake as to the exact superiority in number of his opponents) it required all Wellington's rare tenacity of purpose to undertake; yet undertake it he did, depending on Blücher's promise to join him an hour after midday.

On the morning of the 18th, the two armies found themselves ranged in battle-array opposite each other: the allies, posted on a line of eminences, had their left wing resting on Frischermont, the farm-house of La Haye Sainte in front of their center, while their right wing curved convexly round behind Hougomont, and rested on Braine Merbes. The French were ranged on a parallel row of eminences, having La Belle Alliance in their center, with some divisions of cavalry and infantry in reserve behind the right wing; Kellermann's dragoons behind the left wing; and the guard, stationed with the 6th corps, in the rear. Skirmishing had continued all the morning; but the first serious attack was not made till between eleven and twelve, when a part of the 1st corps advanced against Hougomont, with the view of making the more important attack to be made against the allied left. This preliminary assault, however, though unsuccessful, was maintained with great vigor for a considerable time; till Napoleon, dreading a further loss of time, prepared to make his grand attack on the left center. At this time (half-past one P.M.), he learned that the advanced guard of the 4th Prussian corps (Bulow's) was appearing in front of St. Lambert, 2 to 3 m. to his right; and being forced to detach his 6th corps (Lobau's) with the reserves of cavalry behind his right wing, to keep them in check, he had to modify his grand plan of attack on the Anglo-Netherlanders, and accordingly ordered Ney to break through their center. At two P.M., after a furious preliminary cannonade, from which Wellington sheltered his men (as at various other times during the battle), by retiring them to the reverse of the slope, Ney advanced against the left center with 20,000 men, but had only succeeded in putting to flight a Belgian brigade, when he was attacked and driven back by Picton's division, his retreating columns charged and broken by the English cavalry, and 2,000 prisoners taken. Nevertheless, after a brief space, Ney returned to the charge, and carried La Haye Sainte, though his repeated attacks on the infantry in position were constantly repulsed, and his retreating columns severely handled by the British cavalry, who, disordered by success, were as often overthrown by the French cuirassiers. By this time (half-past four P.M.), Bulow had succeeded in deploying from the woods, and, advancing against Planchenoit, in the rear of the French right, carried it after a vigorous conflict. Lobau's corps, however, aided by a re-enforcement from the guard, speedily re-took the post, and driving the Prussians back into the wood, secured the French right flank for a time; Napoleon, though now learning that another Prussian corps (the 1st, under Ziethen) was coming up by Ohlin to join the allied left, being still confident that he could destroy the Anglo-Netherlanders before the Prussians could render effective aid. During the conflict with Bulow, Ney had been warmly engaged with the center and right of the enemy, who had made various attempts to regain the wood of Hougomont and La Haye Sainte, and had supported his repeated attacks with not only his own cavalry, but (by, at any rate, the "tacit consent" of the emperor) with the cuirassiers, lancers, and chasseurs of the guard, and the whole of the mounted reserve, without, however, producing any result other than a great slaughter on both sides, and the useless sacrifice of 18,000 of the finest cavalry ever seen. Napoleon now resolved on another vehement assault on the immovable British center, and directed against it in succession two columns, one composed of four battalions of the middle guard, and the other of four battalions of the middle and two of the old guard, supporting them with flank attacks of other infantry divisions, of cavalry, and with a dreadful fire of artillery. The advancing French were met with a well-sustained fire from every piece which could be brought to bear upon them; the first attacking column was fairly driven down the slope by the English guards, and the second was totally routed by a bayonet-charge of Adams' brigade, the British cavalry following up the fugitives. Ziethen had now (7 P.M.) joined the left of the English line; Bulow, further re-enforced, had carried Planchenoit, and

was driving the French right wing before him; and the combined attack on the retiring masses of the French by the whole effective force of the Anglo-Netherlanders on the one side, and of the Prussian cavalry on the other, converted an ordinary, though severe defeat into a rout unparalleled in history. The magnificent cavalry, wantonly destroyed by Ney in fruitless attacks upon an "impracticable" infantry, would then have been of incalculable service, but they were no longer to be had. The last square of the guard still stood its ground, to protect the flight of the emperor; but it was speedily surrounded, and on the soldier-like refusal of Cambronne to surrender, was in a moment pierced through and broken to pieces. From this time all resistance was over; the roads southward, especially that to Genappes, were crowded with fugitives fleeing for their lives from the pursuing cavalry; and though the English light cavalry, exhausted with their severe work during the battle, soon ceased the pursuit, it was kept up with great energy throughout the whole night by the Prussian troopers, who seemed bent upon at once avenging the defeats of Jena, Auerstadt, and Ligny, and glutted their fierce animosity by an indiscriminate slaughter. The total loss in this battle was, from the obstinacy and determination with which it was contested, necessarily large; the figures are: British and Hanoverians, 11,678; Brunswickers, 687; Nassauers, 643; Netherlanders, 3,178; a total of 16,186; which added to 6,999 Prussians, gives the aggregate allied loss, 23,185. The French had 18,500 killed and wounded; 7,800 prisoners (some French accounts raise the total list of *hors de combat* to 32,000), and 227 cannon captured.

This great battle has given rise to numerous controversies among the British, French, and German historians of the great struggle between Europe and Napoleon—the points in dispute being, (1) as usual, the numbers engaged on each side, (2) the ability shown by each general in his dispositions for the conflict, and (3) the relative share of the British and Prussians in producing the final result. These questions can be briefly and satisfactorily answered. The strength of the English army is known from official estimates; the French army, as shown by its maneuvers throughout the day, was more numerous, and though its amount cannot, with perfect accuracy, be ascertained, it was certainly over 70,000, and under 80,000; but the fact that many Belgians in the duke's army took to their heels as soon as the French marched toward them, and fled direct to Brussels, increased the disproportion, already sufficiently great, between the two armies; the Prussians had only 35,000 men under fire at Waterloo, and half of these only for about half an hour. Fault has been found with Wellington for giving battle in front of a wood, but the accusation is foolish, as several good roads traversed the wood, thus affording means of retreat, if necessary, and the wood could have been held by skirmishers to protect the retreating infantry. Napoleon's faults were chiefly—the late hour at which he (not calculating on the arrival of the Prussians at all, and certainly not without Grouchy) commenced the conflict, and the reckless manner in which his cavalry reserves were wasted; and his neglecting to take into account the steadiness—a steadiness new to one of even his experience—with which, as he was warned by Soult, who knew it only too well, the British infantry were wont to maintain their ground. As to the third point, there is no doubt that Bulow's attack on Planchenoit distracted Napoleon's attention, and drew off 10,000 of his forces; but though the Prussians had not come up, the battle could not have been otherwise than a drawn battle; however, the effect of their successful attack on the French right, by taking in flank also the squadrons which recoiled before the invincible steadiness of the British, was the conversion of an otherwise drawn battle into a glorious victory. Each of the three nations claims its right to give name to this famous conflict—the French calling it after mount St. Jean, a château in rear of the British line; the Prussians after La Belle Alliance; while the true victors on the bloody field assert their rightful claim, and will hand it down to all future ages as the *battle of Waterloo*. See col. Chesney's *Waterloo Lectures* (1868).

WATERLOO, ANTONI, 1600–62; b. Holland; a member of the Utrecht guild of painters. He was an excellent engraver, whose works still bring high prices. He is said to have left 136 engravings. He also painted Dutch landscapes, one of the best known of which is his "Fishermen," now in Florence.

WATER-MARK, the manufacturer's mark on various kinds of paper. See **PAPER**.

WATER OUSEL. See **DIPPER**.

WATER-POWER. The value of water-power depends much on the nature of the source of supply, whether steady or otherwise. Where streams supplying water-power are liable to fall off much in dry weather, large impounding reservoirs are necessary to keep the mills from being stopped during summer. These, however, being generally expensive concerns, are seldom made for one mill, but rather by some association of mill-owners; and often by a water company or commission for supplying a town with water, to afford compensation to the mills by storing up flood-water, for what is abstracted for the use of the town. On small streams there is generally a pond provided fit to hold a night's water, or, perhaps, even a Sunday's, in addition; but in the case of large rivers, there is, in general, only a weir or dam across the river to direct the water into the intake lade. When the inclination in the bed of the stream is small, the lades require to be proportionally long, to give sufficient fall, and are often above a mile long or more from the intake to the lower end of the tail or discharge lade, where the water is re-

turned to the stream. The rise and fall of the tide has been frequently used for driving water-wheels.

The most usual, and generally the most eligible, mode of applying water to the driving of machinery is by means of a vertical wheel; and the wheel is put in motion either by the water acting on blades or floats by impulse derived from its velocity acquired in falling, or by the weight of water being applied to one side of the wheel. The former mode of applying the water is generally adopted in low falls, say under six ft. or thereabouts, and to what is called an undershot wheel—i.e., a wheel where the effective head of water is below the level of the center; and to make the application efficient, that portion of the periphery of the wheel measuring from the point of impact of the water to a point directly below the center, requires to be surrounded by a casing generally of stone, but sometimes of cast-iron, called the arc, closely fitted to the extremity of the floats, so as to prevent any considerable escape of water.

The wheel, which may be either of timber or of cast-iron, or partly of both, consists of axle, arms, floats, which are generally radii of the circle, but are sometimes set a little obliquely to the radius, pointing up stream; and generally there are also a sole, being a lining round the circumference at the lower edge of the floats, having openings for the escape of air; and a shrouding or circular plate at each side of the wheel, and of the same depth as the floats.

Sometimes, when there is very little fall beyond the mere current of the stream, the floats simply dip into the water like the paddles of a steamer, in which case no sole or shrouding is required; and to make allowance for the rise of the water in the tail-lade during floods, which is generally called *back-water*, and seriously impedes and sometimes stops the motion of the wheel, occasionally the wheel and its arc are so constructed as to be capable of being raised or depressed together, without throwing the machinery out of gear. This is done in the case of the Inverness water-works, where the wheel is liable to be much affected by the rising and falling of the river Ness.

Sometimes in this country, and often on the continent, the machinery is all on board a vessel moored in a river, so as to rise and fall with the level of the water, and thereby keep its water-wheel always immersed to the proper depth. At the old London bridge water-works the wheels, which rose and fell with the tide, were worked by the current of both the flood and ebb.

The other mode of applying the water to a vertical wheel by making it act by its gravity, is the more perfect and economical mode, where circumstances will admit of it, and is generally adopted in falls of any considerable height, say of six ft. and upward, and where the water can be let on above the level of the center. The wheels are called respectively *breast* and *overshot wheels*, according as the water is let on more near to the level of the center or to the crown of the wheel; and they have, instead of straight floats, curved or kneed buckets, according as they may be made of iron-plate or of wood, and of such a shape as to retain the water down to the lowest possible point. There are generally in good wheels ventilating openings in the sole for the escape of air. The overshot wheel has this disadvantage that, as the water has little or no power until considerably past the top center, the wheel is burdened with a useless weight of water.

The direct overshot wheel has the water run, without changing its direction, right over the top; which arrangement has this advantage, that as the top of the wheel moves in the same direction as the stream, it gets the benefit of the whole initial velocity and impulse of the water; but, on the other hand, the bottom of the wheel, if at all immersed in water, which it generally is to some extent, meets with obstruction by moving against the current.

The *pitch-back overshot* is a modification of the last, making the water to pass alongside the wheel, and then to return and be let on the top of the wheel in a contrary direction. This requires longer and more complicated troughs, and by the change in direction, part of the impulse from the water is lost, but the bottom of the wheel moves in the direction of the tail-water, and is not liable to be impeded by being immersed in it.

On the whole, it is generally thought better to apply the water at about 30° from the top of the wheel. In such high-breast or nearly overshot wheels, the water is let on to the buckets over the top of the sluice, which is made to open by lowering, and shut by lifting. In this way, however small may be the quantity of water, it is always applied at the highest possible level, which is of importance when it is its weight multiplied by the height of descent, not its impulse, that yields the effective power.

The structure of the overshot and breast wheel is nearly the same as that of the undershot, excepting in the substitution of curved or angular buckets, for straight floats; but even in the undershot wheel the floats are sometimes made with a slight curvature.

In any description of wheel, the motion may be taken off the axle by torsion, which necessarily requires rigidity in the arms; or it may be taken directly off the periphery, when the power is applied to a pinion working into segments, either external or internal, attached to the shrouding. In this arrangement there is no torsion of the axle, or transverse strain on the arms, and therefore the latter are more often made of round, wrought-iron rods, with a slight axle. This wheel is much lighter than with the massive axle and the strong wooden or cast-iron arms, and is called a *suspension* or *spider-wheel*.

In reckoning the power of water, its weight being $62\frac{1}{2}$ lbs. to a cubic foot; theoretically 528 ft. falling vertically 1 ft. a minute, would be equal to 1 Boulton and Watt horse-power of 33,000 lbs. lifted 1 ft. a minute; but the effective power is far short of that, and 60 per cent of it, requiring 880 cubic ft., falling 1 ft. a minute, is generally reckoned a fair allowance for an effective horse-power. Seventy-five per cent, requiring 704 ft., falling 1 ft. a minute, is about the highest that has ever been spoken of, and it is doubtful whether even more than 70 per cent has ever been attained; while with low falls and imperfectly constructed wheels, it is often reckoned that a horse-power requires nearly 100 cubic ft. a minute.

The velocity of the periphery of an undershot wheel is usually from 500 to 600 ft. a minute, and that of a bucket-wheel, overshot or breast, from 300 to 450 feet. It is seldom that the whole height of a fall can be advantageously made use of; for if the wheel be placed so low as to get the benefit of the whole height of the fall in low states of the water, very often it is liable in floods, to have the lower rim immersed, and to be obstructed or stopped by back-water.

The most extensive application of water-power to one work in Scotland, or probably in Britain, is that of Deanston cotton mills, on the river Teith, 6 m. above Stirling, where there are in one house four wheels, 36 ft. in diameter, and 12 ft. in breadth, and having a volume of water of $8\frac{1}{2}$ millions of cubic ft. in 10½ hours a day—falling 33 ft. a minute. The most systematic application of water-power, however, is probably that of the Shaws water-works, now the property of the corporation of Greenock. There the yield of nearly 7,000 acres of hill-ground is stored up in reservoirs of a capacity of 320,000,000 of cubic ft., and conveyed by an aqueduct of about 6 m. in length to the outskirts of Greenock, which it reaches at the level of 512 ft. above the level of the sea, and is then divided into two lines of falls, one having 1200 cubic ft. a minute for 12 hours a day, and the other the equivalent quantity of 1066 ft. for 13½ hours a day, divided each into 19 falls, for which those already appropriated pay per annum from £1 15s. to £4 5s. per horse-power, according to their distance from the center of the town, and their height above its level. One foot of fall for each line is reckoned 1.8 horse-power, which is a very high computation, being 79.2 per cent of the theoretical horse-power. At the "cotton mill," where both lines of falls are combined, there is the largest, or nearly the largest water-wheel in existence. It is 70 ft. 2 in. in diameter, 13 ft. wide, with 166 buckets, having a depth of 17 in. It has 2,266 cubic ft. of water per minute, with a fall of 64 ft. 4 in., and is therefore nearly 200 horse-power. By the Shaws computation, it would be 218 horse-power. It is a spider wheel, taking the power off the circumference.

Of horizontal wheels: In the proper turbine (from Ital. *turbino*, a whirlwind), the water passes either, first, vertically down through the wheel between fixed screw blades, which give it a spiral motion, and then strikes similar blades attached to a movable spindle, but placed in the opposite direction, so that the impact of the water communicates a rotatory motion to the blades and spindle, or second, a modification of the foregoing is to pass the water from the center horizontally outward through fixed curved blades, so as to give it a rotatory or tangential motion, and thereby cause it to act on the blades of the wheel which revolves outside.

In the reactionary wheel, which is in principle almost identical with Whitelaw and Stirret's wheel, previously described under the article BARKER'S MILL, the water is admitted at the center of the wheel from below, passes to the circumference between curved blades of the wheel, and escapes by tangential orifices at the circumference, there being valves made to open more or less, according to the quantity of water and to the power required.

The vortex wheel of prof. Thomson takes in the water after descending through tubes, at the circumference, where, by means of fixed blades, it acquires a tangential motion, and then passes through between the curved arm of the wheel, and escapes at the center. As the two last described wheels work always under water, they are not liable to be obstructed by back-water, or to have their power lessened thereby more than what is due to the diminished fall, and they are understood to yield a good percentage of power, sometimes stated at 75 per cent; but all turbines are somewhat delicate, and liable to be choked by leaves or twigs, unless the water be carefully strained. Although only a few horizontal wheels have been described, their name is legion, and it would take a book to mention them all, or to describe their respective merits.

The reciprocatory hydraulic engine works exactly on the same principle as the ordinary non-condensing steam-engine. The water, under considerable pressure, is admitted at one end of a cylinder, the exit valve at that end being simultaneously closed, while it is shut off from the other end, and the exit valve there opened; and so the alternating action of the valves and of the piston goes on continuously. To work smoothly and effectively, the piston ought to be of large diameter, in proportion to the length of stroke, and to go slowly; otherwise the quick jerking is apt to shake and to injure the engine; and generally it is better to have two cylinders and pistons working together, as that enables them to work more equally, and to turn the crank without the use of a fly-wheel.

Both the turbine and the reciprocatory engine have been made use of as water-meters.

The turbine and the reciprocatory engine have the advantage of being able to take the use of a fall much greater in height than the diameter of the largest wheel that can

be made; but for all ordinary falls, a good breast or overshot wheel, or even an undershot, is, on the whole, generally considered better.

WATER-PROOFING. See CAOUTCHOUC. Besides the application of caoutchouc, peculiar methods have been employed to render cloth impervious to water, at the same time allowing the passage of air, the absence of this property in the impermeable caoutchouc manufactures having been found disadvantageous. Two plans are adopted for water-proofing woolen cloths, without rendering them quite impervious to air—the first is to dip the cloth into a solution of soap, and thoroughly rub it into the texture, after which it is dipped into a solution of alum; a decomposition of the soap and alum is effected, and the minute openings between the fibers are in some way partly filled so as to exclude water. In the second plan, the cloth is dipped into a solution of gelatine or isinglass, and afterward in a solution of galls. A kind of tanning process is the result, the gelatine which has pervaded the cloth being rendered as insoluble as leather by its union with the tannin of the galls.

WATER-SHIELD. *Brasenia peltata*, now classed with the water-lilies in the family *nymphaeacea*. It has long, slender stems which arise from prostrate root-stocks. The oval leaves, having the slender petioles attached at the center, are from 2 to 4 in. long, and float on the surface of the water. The upper surface is green; the under surface and all the other parts, of a dull purple. The solitary flowers, on axillary peduncles, bloom at the surface, but soon become submerged. The calyx and corolla are each composed of four parts, with from 12 to 18 stamens, and from 4 to 18 pistils. The plant grows in water varying from 1 to 15 ft. deep. The only species known is that named above, which grows in ponds and slow streams from Canada to the gulf of Mexico along the northern border of Puget's sound, and in eastern India and Australia.

WATER-SPOUT. See WHIRLWIND.

WATER-SUPPLY. Water is one of the primary wants of human life, no less essential than air and food; hence the strong and religious interest that has always been attached to the means of its supply. In the earliest records of civilization, we read of the digging of wells, and of quarrels about the possession of them. The "pools of Solomon," near Bethlehem, which remain now almost as perfect as when they were built, were connected with a scheme for supplying Jerusalem with water. In Assyria and Persia, from the earliest times, water has been conveyed to towns from astonishing distances in open channels or canals, and in subterranean tunnels, or *kunats*. In Egypt also, and in China, gigantic works for conveying water, both for domestic use and for irrigation, have been in existence from remote antiquity. Nor were these undertakings confined to the eastern hemisphere; we have evidence of the existence of kindred works in pre-Christian America. The ancient city of Mexico, which was built on several islands near the shore of the lake, was connected with the mainland by four great causeways or dikes, the remains of which still exist. One of these supported the wooden aqueduct of Chapultepec, which was constructed by Montezuma, and destroyed by the Spaniards when they besieged the city. Hydraulic works on a great scale had also been executed by the Incas of Peru. Of all the ancient nations, the Romans paid the greatest attention to the supply of water, and carried the construction of *aqueducts* to the greatest perfection and magnificence. If we except the supply of New York from the Croton river (see *AQUEDUCT*), and that of Glasgow from Loch Katrine, the efforts to supply modern cities are as yet insignificant compared with those of the Romans. The last-named works, finished in 1858, can convey 50,000,000 gallons a day a distance of 26 miles. It is only since the beginning of the sanitary movement, occasioned by the repeated visitations of cholera beginning with 1832, that the subject of water-supply, and more especially the *quality* of water-supply, has seriously occupied public attention. The result of every inquiry and every day's experience has been to bring out more strongly the decided effects on the health of a community arising from the quantity and quality of the water at their command; and as the river and surface sources of supply near the chief seats of population are becoming every year more contaminated by sewage (q.v.), the drainage from manured land, the droppings of animals, and the refuse of manufactures, enterprise and engineering skill must be directed either to procuring a supply of pure subterranean spring water from the chalk or other absorbent strata, or to bringing pure water from greater distances than hitherto. In 1867 a royal commission was appointed to inquire into the condition of the water-supply of London; and numerous schemes were laid before them. Mr. Bateman proposed to utilize the high drainage-grounds of north Wales, from which the river Severn is supplied, having an area of 204 sq. miles. The water was to be conveyed for the most part in an open aqueduct 173 m. long, and capable of carrying 230,000,000 of gallons a day, to service-reservoirs on the high land near Stanmore, about 10 m. from London (from which it was to be delivered, at high pressure, by means of pipes, to the whole city). The total cost was estimated at £11,400,023. On the ground of the distance, the committee reported against the proposal; as, on like grounds, they also did against a rival scheme for taking the supply from the lake districts of Cumberland and Westmoreland. Owing to the exceptionally great rain-fall in these regions (140 in. on an average), it is calculated that the two lakes of Ullswater and Haweswater, with a drainage of 100 sq.m., receive together an average daily discharge of 550,000,000 gallons. From this water it was proposed to supply not

only the metropolis, but the principal towns of the n.w. of England; but from various causes the scheme was abandoned. A bill has lately passed both houses of parliament to supply Manchester with water from Thirlmere. The Thames water has in some respects a superiority over the soft waters usually obtained from high gathering-grounds. It is well aerated, and keeps well. Recently, a covered conduit, 80 m. long, has been constructed, which conveys 8,000,000 gallons of pure chalk spring-water from the sources of the Dhuis, in Champagne, to Paris; and operations are about complete to bring the chalk springs of the Vanne, calculated to yield 22,000,000 gallons a day, also to Paris, a distance of 104 miles.

The chief points of interest on this subject may be arranged under the heads of the sources of supply, the qualities of water, and the arrangements for its conveyance and distribution.

Sources of Water.

The ultimate source of all *fresh* water is rain (q.v.). When it has fallen on the earth, it presents itself chiefly in the forms of surface-water, rivers, and springs.

Surface-collection.—Rain-water, as it is formed in the upper regions of the atmosphere, is the purest that nature supplies; but in descending, it brings with it whatever impurities are floating near the surface, which, in the neighborhood of towns, are numerous, consisting of various gases, together with soot and other floating particles, organic and inorganic. Rain-water has a strong affinity for organic impurities—that is, the corrupting ingredients derived from vegetable and animal bodies, and which are diffused over every surface in the vicinity of living beings; hence, when collected from the roofs of houses, it has a tendency to rapid putrefaction. Being free from saline ingredients, it is excellent for washing, but is not generally pleasant to drink.

But if we resort to a barren district of rock, destitute of vegetation, and remote from the pollution of towns, we may obtain water with comparatively little organic impurity. Notwithstanding several defects, it happens in various places that a surface-supply is the best that can be had.

Rivers.—The water obtained from running streams is in part what has flowed immediately from the surface, and in part the water of springs, shallow or deep. In any case, a considerable amount of contact with the ground has taken place, and in consequence saline and organic matter is liable to be dissolved in a greater or less degree. The extent of the impregnation, as well as the kind of material dissolved, will depend on the rocks and strata of the river-basin.

River-waters, besides the qualities they derive from their primitive sources, are apt to contain mud, decayed leaves, the exuvie of fish, and other matters in suspension, and are thus deficient in the clearness and transparency so essential to the satisfaction of the eye in a drinking-water. Moreover, the water partakes of the extremes of summer and winter temperature. But the great objection to water from rivers is their general pollution from the manure used upon the land, sewage, and manufactures, so that there are now few rivers left from whose lower course a supply could be taken for domestic purposes. On the other hand, the supply from one of our large rivers is boundless and unailing; and it conveys the surface-drainage and spring effusions of a large tract of country, without incurring any trouble or expense as to the original sources. Rivers that issue from lakes are generally the purest, as the suspended matter has time to be precipitated.

Springs.—The qualities that recommend water to the eye and to the palate belong in a pre-eminent degree to spring-water (see SPRING): it is clear, sparkling, and of an agreeable and uniform temperature at all seasons of the year (about 50° Fahr.); it is well aerated, and is totally free from the offensive taint so common in all other waters, as well as devoid of the animalcules generated by organic impurity; and where a sufficient number of springs can be collected to suffice for a town, it is the most desirable of all sources of supply. About a quarter of the water brought to Edinburgh is spring-water collected on the slopes of the Pentlands.

Quality of Water.

Perfectly pure water is hardly to be found; rain-water, and even artificially distilled water, are only approximates. The chief impurities may be considered under the heads of mineral matter in suspension, mineral matter in solution, and organic matter.

Mineral Matter in Suspension.—When running water comes upon a loose bottom, it carries the finer particles of sand and earth along with it. If the water comes into a position of perfect stillness, the matters thus floated gradually sink to the bottom again. Particles of clay, owing either to their excessive fineness or to their adhesive attraction for water, subside very slowly, and impurities of this nature are not easily remedied. Besides earthy matter, compounds of iron and lead are also in some circumstances present in a solid state, and may be got rid of by filtering. To separate clay-powder from water, the practice has long been resorted to in India and China of putting in a piece of alum, which seems to produce a kind of coagulation.

Dissolved Mineral Matter.—Spring-water, which is generally clear and sparkling, holding no solid matter in suspension, is seldom without a large amount of dissolved mineral matter, sometimes as much as 2 parts in 1000, commonly from 1 in 1000 to 1 in

20,000. River and surface water also contains more or less dissolved minerals (see MINERAL WATERS). The great bulk of the solid matter held in solution in ordinary waters consists of the salts of soda, potash, lime, and magnesia. The most material are the salts of lime and magnesia, as they are the causes of what is called "hardness" in water, which we shall speak of more particularly afterward. The most important salt of lime is the soluble hydric carbonate formerly known as *bicarbonate*, which is derived from chalk or limestone. Chalk or limestone is a *carbonate* of lime (otherwise *calcic carbonate*)—that is, a compound of lime with one equivalent of carbonic acid (carbonic dioxide)—and is almost insoluble in water; but when water containing an excess of carbonic acid—as is the case with spring-water especially—passes over limestone, it gives the carbonate a double dose of carbonic acid, and converts it into bicarbonate, which is soluble. The waters having bicarbonate of lime for their chief impurity are familiarly spoken of as the chalk-waters. The other salt of lime often present in water is the *sulphate* or *gypsum*. The important distinction between the bicarbonate and the sulphate lies in the fact, that the first, the bicarbonate, may be in great part precipitated, or thrown down in a solid form, by boiling, which drives off the solvent carbonic acid; whereas the second, the sulphate, cannot be so precipitated. The chief effect of the boiling takes place in the first five minutes.

Apart from its hardness, it has been made a question whether water containing salts of lime is injurious or not to the human constitution. Dr. Lankester holds that there is evidence to prove that carbonate of lime in large quantity is positively injurious; and most physiologists are agreed that pure water is the best for securing the health of animals and man.

With regard to magnesia, its salts are well known to act as powerful medicines when taken in large doses, and it may be presumed are not altogether without effect in the small quantities existing in ordinary magnesian waters. A foreign physician has lately made the observation, that magnesia is the characteristic ingredients of water in the districts where the diseases called *cretinism* and *goiter* abound.—Of salts of *soda* and *potash*, the principal is common salt, or the chloride of sodium. Sodie sulphate (Glauber's salt) occurs along with the chloride in the salt-springs of watering-places as well as in the sea-waters. None of all these salts have any effect on the hardness. In the case of sea-water, which is very hard, the effect is not due to common salt, but to the lime and magnesian salts dissolved in it; were it not for these, sea-water would be perfectly suitable for washing, although not for drinking.—Salts of *iron* in considerable quantity make what are called technically named *chalybeate* waters, which belong to the medicinal class. When the iron exists in the spring as carbonate, which is the most usual case, on exposure to the air it is changed into the peroxide, and falls down in the form of an ochery precipitate. Salts of iron give an inky taste to the water, and a yellowish tint to linen washed in it.

Hardness in Water.—The quality of hardness in water is commonly recognized by the difficulty experienced in washing, and by the amount of soap necessary to form a lather. This quality is injurious also in the preparation of food; but its action is most universally felt in washing-operations. It occasions the chapping of the skin, an enormous waste of soap, an extra labor, and a corresponding tear and wear of clothes. Every grain of chalk contained in water decomposes 10 grains of soap; and thus the hardening matter contained in 100 gallons of water, such as is supplied to London, will destroy 35 oz. of soap—that is, the first 35 oz. of soap added to this quantity of the water will disappear without forming any lather, or having any cleansing effect. Soap is a compound, formed of an alkali (soda or potash) joined to an oily acid. When a salt of lime, then, is present in the water, the lime decomposes the soap, and combines with the oily acid to form a lime-soap, which is insoluble, and has no detergent properties.

The most usual hardening ingredients are the salts of lime. Salts of magnesia and of iron are also hardening salts. Salts of soda and potash have no hardening effect. Dr. Clark, formerly professor of chemistry in Marischal college, Aberdeen, has devised a scale of hardness which is now universally employed in the chemical description of waters. The hardening effect that would be produced by one grain of chalk dissolved in a gallon of water is one degree of hardness; in like manner, four grains per gallon would produce four degrees of hardness; ten grains, ten degrees; and so on. The degrees are expressed in numbers—thus, 1°, 4°, 10°, 15°, are one, four, ten, fifteen degrees respectively. The degree of hardness of any particular water can be readily and exactly determined by Dr. Clark's soap test (q.v.).

Next to washing, the deleterious consequences of hardness are felt in various culinary operations, especially in the furring of boilers and cooking utensils, and in the infusion of tea. It is a fact of universal experience that hard water requires more tea than soft water to make an infusion of the same strength, and also renders the infusion muddy. Subcarbonate of soda in crystals, by decomposing the earthy salts, improves the water; but if more is added than what will exactly decompose the earthy salts present, it injures the fine flavor of the tea. It may be stated generally, that for the purposes of washing and cooking, a water of less than 6° is soft, but above this point the hardness becomes objectionable. At 8°, the water is moderately hard; at 12°, it is very hard; at 16°, the hardness is excessive; and much above this, it is intolerable.

To make these observations more intelligible we may mention a few instances of

known waters, with their place in the scale. In Keswick the water is under half a degree of hardness; in Lancaster it is $1\frac{1}{2}^{\circ}$; and in Manchester, 2° . The water of the Dee at Aberdeen, which is used for the supply of the town, is $1\frac{1}{2}^{\circ}$ of hardness. The water of loch Katrine is of great purity, having only two grains of solid matter of all kinds in the gallon, and 1° of hardness. The waters of the Welsh mountains, from which it has been proposed to supply London, have on an average less than 2° . The river Clyde, which formerly supplied Glasgow, is $4\frac{1}{2}^{\circ}$, and may also be reckoned a soft water. The Thames at London, as well as the New river, is about 14° , while many of the tributaries of the Thames rise as high as 16° ; but being all chalk-waters, they may be materially softened by boiling. Springs from the chalk commonly range from 16° to 18° ; but particular springs are to be met with in some parts of the world four or five times as hard, from the presence of bicarbonate of lime. The water of the treasury pump in London has from 50° to 60° of hardness. In many parts of the continent hard waters abound; but the testing of waters has not been so much attended to there as in this country.

The evidence laid before the royal commission above referred to went to prove that there is no reason whatever to suppose that the hardness of the Thames water, which averages about 15° , would be in the least degree prejudicial to health. It appears that the hardness of springs is generally considerable; and that surface-waters may be collected in a state that is to be considered soft (4.94°).

Lead in Water.—Injurious effects have frequently arisen from the contamination of water with lead, derived from leaden pipes and cisterns. Some kinds of water are known to act powerfully on a leaden surface, and others scarcely at all; but the qualities and circumstances on which the action depends have never been satisfactorily determined. Distilled water, and soft lake and river waters in general, act most decidedly, but by no means in proportion to their softness. The presence of air in the water seems one essential condition; light also increases the action, as does the presence of vegetable matter; it has been observed that when leaves drop by chance into a lead cistern, the spots where they lie become visibly corroded. The water of loch Katrine, according to extensive sets of experiments by distinguished chemists, is allowed to have an intense action* on lead under certain circumstances—viz., “1st, If the lead be bright and highly polished; and 2d, If the lead and water be freely exposed to the access of air.” But it “does not exert any noxious action on lead when the metal is in its ordinarily dull state.” The coating formed on the surface of the metal is held to protect it from further chemical action. Still there are opposing facts to show that this protective action is not always to be relied on; and that water that has passed through any considerable length of lead pipe, or stood for some time in a short one, or in a cistern, should never be used without care; a ninth part of a grain of lead per gallon has been known to derange the health of a whole community. Dr. Clark made the unexpected discovery that sand-filters completely separate the lead.

Organic Impurities.—The contamination of water by vegetable and animal substances takes place in various ways. The most obvious and abundant source of this class of ingredients is the sewage and refuse of towns; and next in order may be ranked the contact with soils rich in organic matter. Among organic impurities may be classed offensive gases, such as carbureted, sulphureted, and phosphureted hydrogen; vegetable fibers in a state of rotteness; putrefying products of the vegetable or animal kingdoms; starch, muscular fiber, etc.; urea and ammoniacal products; vegetable forms—algæ, confervæ, fungi, etc.; animalcules—infusoria, entomostracæ, annelidæ or worms, etc. Water falling on a growing soil, and running off the surface to lie in stagnant ponds, is in very favorable circumstances for being tainted with vegetable and animal life. Water-plants will spring up and feed numerous tribes of animalcules, and each pool will be a constant scene of vitality. In such a state the water is usually unfit for drinking; the palate instantly discerns a disagreeable taint, and no one will use it who can do better. The surface water of a district overgrown with peat-moss has usually a peaty flavor, as well as a dark and dirty color. The infusion of peat does not breed animalcules, being a strong antiseptic; but it is an objectionable ingredient nevertheless. Very slow filtration has been found to remove the color of the infusion in some degree, but not entirely. Lime removes the peat most effectually, but there is both expense and risk in applying it. It is perhaps doubtful whether any specific unwholesomeness can be justly attributed to peat-water; but it is unpalatable, and the use of it is shunned by the inhabitants of peaty districts, and even by cattle. The presence of peat in the lands used as collecting grounds for surface-water—and it is generally such worthless tracts that are so employed—is a disadvantage attending that mode of supply.

Chalk-water, which, as it issues from a spring, is perfectly free from organic matter, has a source of contamination within itself. When exposed to light and air, the duplicate dose of carbonic acid that keeps the chalk dissolved, becomes decomposed; and the carbon of the decomposed acid gives rise to a green vegetation, which soon acquires an offensive marshy smell.

Organic matter in a putrefying state forms the worst kind of contamination that

* The water of loch Katrine is remarkably well aerated, having $7\frac{1}{2}$ cubic in. of air per gallon, of which $2\frac{1}{2}$ in. are oxygen. Dr. Clark had a suspicion that the oxygen may turn out to be in some different state or modification from common oxygen.

water can have. Though we may not know the precise effects of these impurities on the animal system, the single fact of their rendering the water repulsive to the taste and nauseous to the stomach would be sufficient to condemn their use. What is disagreeable to the senses, must be presumed to be unwholesome in addition, until the contrary is proved. Though no one has ever yet gone the length of maintaining, as a general truth, the wholesomeness of water abounding in vegetation, insects, and decaying matter, yet the water of the Thames, even within the influence of the tides, where it is contaminated by the whole sewage of the metropolis, found defenders until lately, on the plea that the amount of impurity was too small to do harm. This ground is at length given up; but Thames water above Teddington lock is still sanctioned as safe water for the companies to supply to the inhabitants of London, notwithstanding the sewage of the numerous populous towns that the river receives above that point. As to this plea of smallness of amount, the highest medical authorities hold that it is impossible to say how small a quantity of organic matter in a state of fermentation may not do harm. We are not, however, left merely to presume that organic impurity in water is prejudicial to health. During the cholera visitation of 1853-54, a gigantic experiment was undesignedly made on half a million of human beings. It so happened that a certain district of London was supplied by two rival water-companies, the two mains running often side by side, and some houses taking water from the one, and some from the other. The whole inhabitants were living alike in all respects save one—viz., that one company drew its water from high up the Thames, where it was of comparative excellence, while the other drew its water from low down the river, where it was profusely contaminated with town-drainage. Among this population, there were more than 4,000 deaths from cholera; and when the epidemic had subsided, an inquiry was made, house by house, as to those deaths, and as to the water-supply of the several houses where they had occurred. The inquiry was conducted with every precaution, to avoid sources of fallacy; and the result was this: in the one set of houses, the mortality per 10,000 of the population was 37; in the other set of houses it was 130—that is to say, the cholera death-rate was $3\frac{1}{2}$ times as great in the one set as in the other.

It is a common notion that *every drop of water teems with life*; but this is a mistake. Deep wells, and spring-water in general, contain little or no living organic matter. Consequently, it is quite possible to obtain a liquid perfectly free from animalcules and vegetation. The presence of living creatures, vegetable or animal, discernible either by the naked eye or by the microscope, is a proof of organic taint in the water, and is one of the tests of this kind of impurity. With respect to rain-water, Dr. Hassall states, in his evidence before the general board of health: "I have made several examinations of rain-water immediately after its descent to the earth, obtained in both town and country, and can confidently assert that it does not, in general, contain any form of living vegetable or animal matter." The conditions necessary for the development of vegetation and animalcules over and above the presence of matter for them to feed on, are *air, light, and stillness*. With regard to the probable effects on health of living creatures contained in water, Dr. Hassall's observations are worthy of attention: "All living matter contained in water used for drink, since it is in no way necessary to it, and is not present in the purest waters, is to be regarded as so much contamination and impurity—is therefore more or less injurious, and is consequently to be avoided." There is yet another view to be taken of the presence of these creatures in water—viz., that where not injurious themselves, they are yet to be regarded as tests of the impurity of the water in which they are found."

Means of purifying Water.

The mechanical impurities of water, or the solid particles rendering it muddy or milky, may in most cases be removed by mechanical means. The two processes for this purpose are *subsidence* and *filtration*. The effects of subsidence are strikingly seen in the case of rivers that pass through lakes. See GENEVA, LAKE OF. The subsidence of solid particles depends on their own weight, as compared with the weight of an equal bulk of water. To favor the process, the most perfect stillness should be allowed. It is expedient to have partitions placed in the subsiding reservoirs at short intervals, more effectually to prevent the agitation of the water. The water should be run off from the top, and not from the bottom. By making the bottom of the subsiding reservoir form a declivity from opposites sides, and providing means to let off the water occasionally from its lowest depth, it is possible to get quit of the subsided mud. It is always found of advantage in clearing water from solid particles, whether by subsidence or by filtration, to mix together streams of different qualities.

In constructing an artificial filter on a large scale, a basin is formed, having the floor nearly level, but slightly inclining toward a center line, and made water tight by puddling the bottom and sides with clay. On the floor is laid a series of layers of gravel, coarse at first, and getting gradually finer upward; next, a layer of slate-chips or sea-shells, then one of coarse sand, on which is placed the actual filtering layer of fine sand. The depth of this layer is from twelve to thirty inches, that of the entire mass from four to six feet. The water being admitted gently on the top of the sand, sinks down and is conducted by a series of channels, generally of tile-pipes, into the main drain. A filter in a clean state will pass from twelve to eighteen vertical feet of water in twenty-four

hours. The solid matter intercepted does not penetrate more than than three-fourths of an inch into the sand, so that, by removing a very thin film from the surface, the filter is again clean. What is scraped off the top, is capable of being washed and put again to use. "This process of filtration," says prof. Clark, is "efficacious in removing mechanical impurities to an extent that could scarcely be believed without seeing the process."

The cleansing power of sand can hardly be accounted for on the theory of mere mechanical interception. Though there is no chemical action, strictly speaking there is no doubt that the attraction of adhesion is at work—a power that plays a greater part in natural processes than has generally been assigned to it. Some substances manifest this adhesive attraction more strongly than sand, and have therefore still greater efficacy as filters; though practically, and on the large scale, sand is the most eligible. Powdered charcoal has long been known as a powerful filtering medium, attracting and detaining especially organic matter. Animal charcoal, or that derived from burning bones, is still more efficacious than wood charcoal. A filter of animal charcoal will render London porter almost colorless.

According to recent researches, it would seem that loam and clay have similar properties, and may be made available as filters. Professor Way states that "they have powers of chemical action for the removal of organic and inorganic matters from water to an extent never before suspected." The filthiest liquids, such as putrid urine and sewer-water, when passed through clay, dropped from the filter colorless and inoffensive. The clay used was that known as pipe-clay.

For filters for domestic use, see FILTER.

Softening of Water rendered Hard by Chalk—Clark's Process.—This is one of the most beautiful applications of science to the arts of life that could perhaps be named. We extract the inventor's own account of it (retaining the old nomenclature) as read at the meeting of the society of arts:

"In order to explain how the inventor operates, it will be necessary to glance at the chemical composition and some of the chemical properties of chalk; for while chalk makes up the great bulk of the matter to be separated, chalk also contains the ingredient that brings about the separation. The invention is a chemical one for expelling chalk by chalk. Chalk, then, consists, for every 1 lb. of 16 oz., of lime, 9 oz.; carbonic acid, 7 oz.

"The 9 oz. of lime may be obtained apart, by burning the chalk, as in a lime-kiln. The 9 oz. of burnt lime may be dissolved into any quantity of water not less than 40 gallons. The solution would be called lime-water. During the burning of the chalk to convert it into lime, the 7 oz. of carbonic acid are driven off. This acid, when uncombined, is naturally volatile and mild; it is the same substance that forms what has been called soda-water, when dissolved in water under pressure.

"Now, so very sparingly soluble in water is chalk by itself, that probably upward of 5,000 gallons would be necessary to dissolve 1 lb. of 16 oz.; but by combining 1 lb. of chalk in water with 7 oz. additional of carbonic acid—that is to say, with as much more carbonic acid as the chalk itself contains—the chalk becomes readily soluble in water, and when so dissolved, is called bicarbonate of lime. If the quantity of water containing the 1 lb. of chalk with 7 oz. additional of carbonic acid, were 400 gallons, the solution would be water of the same hardness as well-water from the chalk-strata, and not sensibly different in other respects.

"Thus it appears that 1 lb. of chalk, scarcely soluble at all in water, may be rendered soluble in it by either of two distinct chemical changes—soluble by being deprived entirely of its carbonic acid, when it forms lime-water, and soluble by combining with a second dose of carbonic acid, making up bicarbonate of lime.

"Now, if a solution of the 9 oz. of burnt lime, forming lime-water, and another solution of the 1 lb. of chalk and the 7 oz. of carbonic acid, forming bicarbonate of lime, be mixed together, they will so act upon each other as to restore the 2 lbs. of chalk, which will, after the mixture, subside, leaving a bright water above. This water will be free from bicarbonate of lime, free from burnt lime, and free from chalk, except a very little, which we keep out of account at present for the sake of simplicity in this explanation. The following table will show what occurs when this mutual action takes place:

AGENTS.		PRODUCTS.	
Bicarbonate of lime	} Chalk.....16 oz. = 16 oz. of chalk	} = 16 oz. of chalk	} 2 lbs.
in 400 gallons.....			
Burnt lime in 40 gallons of lime-	} Carbonic acid 7 oz. }	}	}
water.....			
	.....9 oz. }		

"A small residuum of chalk always remains not separated by the process. Of 17½ grains, for instance, contained in a gallon of water, only 16 grains would be deposited, and 1½ grains would remain. In other words, water with 17½° of hardness, arising from chalk, can be reduced to 14½°, but not lower.

"These explanations will make it easy to comprehend the successive parts of the softening process.

"Supposing it was a moderate quantity of well-water from the chalk-strata around the metropolis that we had to soften, say 400 gallons. This quantity, as has already been

explained, would contain 1 lb. of chalk, and would fill a vessel 4 ft. square by 4 ft. deep.

"We would take 9 oz. of burnt lime, made from soft upper chalk; we first slack it into a hydrate, by adding a little water. When this is done, we would put the slacked lime into the vessel where we intend to soften; then gradually add some of the water in order to form lime-water. For this purpose, at least 40 gallons are necessary, but we may add water gradually till we have added thrice as much as this; afterward, we may add the water more freely, taking care to mix intimately the water and the lime-water, or lime. Or we might previously form saturated lime-water, which is very easy to form, and then make use of this lime-water instead of lime, putting in the lime-water first, and adding the water to be softened. The proportion in this case would be one bulk of lime-water to ten bulks of the hard water."

It is of importance that the lime-water—that is, the softening ingredient—be put into the vessel first, and the hard water gradually added, because there is thus an excess of lime present up to the very close of the process. Instead of lime-water, the lime itself may be put at once into the vessel, and some of the water to be softened gradually added to dissolve it. The softened water thus obtained has no action on lead pipes or cisterns, as many soft waters have. One ton of burned lime, used for softening, will produce three and a half tons of precipitate. The present water-supply of the metropolis, if subjected to Clark's process, would deposit about fifty tons of chalk daily.

The process is and has been in successful use on a large scale at various works constructed under the direction of Mr. Homersham, C.E., London, some of them 20 to 25 years since, and others more recently, for softening spring water derived from the chalk, the oolitic, the lower greensand, and other geological formations, for the supply of Aylesbury, Aston, Clinton, and Mentmore in Bucks; the city of Canterbury with its suburbs, and Herbert hospital, in Kent; Castle Howard in Yorkshire, Caterham, Godstone, Nutfield, Redhill, and Warmingham in Surrey; Park Place Henley in Oxfordshire; Tring in Herts. Works have also been more recently constructed for supplying softened spring-water to Sandringham, Norfolk, the seat of his royal highness the prince of Wales, and to Bushey and Stanmore, Middlesex.

The process should always be carried out in suitable covered reservoirs, and is then found to be as conveniently applicable, and even more so, for softening large as small quantities; and spring-water varying from 18 to 20 degrees of hardness by Clark's scale is thus readily softened down and supplied to the consumers at from $2\frac{1}{2}$ to $4\frac{1}{2}$ degrees of hardness. The process for several years past has been in use at Sandhurst, 105 m. n.w. of Melbourne, in Australia, for lessening the amount of organic matter always found to exist in surface-water impounded in large open reservoirs or artificial lakes, and for this purpose is very superior to filtration through sand. Indeed, in the warm climate at Sandhurst, the amount of organic matter becomes so great as to plug up the pores of the sand, and render filtration impracticable.

Natural Process of Purification from Organic Matter.—Although, by means of sand and other filters, or of the liming process, organic contamination of water may be much reduced, there still remains enough to render the water unsafe for use. Is water, then, once corrupted with organic matter, hopelessly and permanently so? This question can be answered in the negative. Filthy water has a tendency to purify itself, and this in two ways. In the first place, in any shallow stream of polluted water, such as the kennels of a street, there may be observed long brushes of a sort of slimy vegetation adhering to every projection of the bottom. All this matter has been disengaged from the water, which thus flows away so much the purer. The second and most effective part of the natural purification consists in the actual decomposition of the impurities. The nitrogen of the decaying matter, then, goes to form nitric acid, which, uniting with bases, forms salts of the class called *nitrates*, of which salpeter is one. Thus, what was in a state of putrefactive change, offensive to the senses, breeding loathsome insects, and causing dangerous disorders, is changed in course of time into a stable and harmless product. This process is constantly going on in rivers and other waters containing organic matter. In the case of streams passing through populous districts, the contamination goes on at a rate far beyond the power of natural purification; but we can easily conceive how a river, very much contaminated with organic impurities at one part of its course, may, after flowing a long way through an uninhabited tract, be almost restored to its natural state. The process is one of oxidation, and takes place at the expense of the free oxygen, of which, in healthy, normal water, there ought to be 29 per cent of the entire volume of gases held in solution.

The oxidation is much favored and hastened when the water percolates or filters very slowly through porous beds of earth. If the filtration has been sufficiently prolonged to convert all the decaying matter into carbonic acid or nitrates, the water will be pure, as far as the organic taint and the presence of animalcules are concerned, and will, in fact, be neither disagreeable nor unwholesome, the amount of the dissolved carbonates or nitrates being unimportant.

Dr. Smith has proved by direct experiment that decomposing organic matter passed through a filtering-bed is changed into nitric acid. "A jar, open at both ends, such as is used with an air-pump, was filled with sand, and some putrid yeast, which contained no nitric acid, was mixed with pure water, and poured on the sand, and allowed

to filter through. The production of nitric acid was abundant." It is not improbable that other earthy matters, such as loam and clay, may have a still more decided influence in hastening the formation of the nitrates; and perhaps by imitating more closely the slow mode of filtration by which nature converts surface-water into spring-water, it may yet be practicable to make the most contaminated waters fit for use.

Conveyance, Storage, and Distribution.

Into the engineering operations connected with the conveyance of water from its source to the town to be supplied, we need not enter, beyond noticing that when the source is below the level of the houses, steam or other power is necessary to lift or propel the water to the necessary height; while in the more general and more desirable case of the source being higher than the place where the supply is to be delivered, the water is made to flow by its own gravitation, either in a channel or culvert with a continuous descent, as in the ancient aqueduct (q.v.), or in the simpler and more economical modern plan of a line of cast-iron pipes following the inequalities of the surface. In many cases, both principles are employed, the water flowing for the most part in a gently-sloping conduit, tunneled through hills where necessary, and being carried through valleys in tubes descending and ascending—an inverted siphon, as it is called. The Croton aqueduct, which supplies New York, is carried across the Manhattan valley, upward of 100 ft. deep, in this way. The Glasgow supply from loch Katrine flows mainly in a sloping channel carried through tunnels and over bridges; but there are four miles of iron pipings across valleys.

The extent of the storage in reservoirs depends on the nature of the supply. If water is derived from perennial springs, whose minimum flow equals the maximum demand, the storage may be the least possible. If a river is the source, the reservoirs should be large enough to hold such a stock as will carry the consumers over the periods when the river is polluted by rains; they should also be large, on the principle of allowing time for purification by subsidence, especially if artificial filtration be not employed. In places where the supply is obtained from surface drainage, or from a small stream, the practice is to build reservoirs capable of containing a five or six months' supply, it being necessary to provide against the greatest droughts that ever happen in any season.

The reservoirs should be deep, so as to prevent vegetation, and the distributing or service reservoirs should be roofed.

In distributing water over a town, two different methods have been adopted, known respectively as the *intermittent* and the *constant* systems of supply. On the intermittent system, water is laid on once a day, or once in two or three days, as the case may be, and fills a tank attached to every separate house, and from this tank the water is drawn off as required. The feeding-pipe of such a tank or cistern is provided with a ball-cock which ingeniously shuts off or admits the supply, as the cistern may be full or empty. On the constant system, no tank is absolutely needed, but the house-pipes are kept constantly charged through their unbroken connection with the distributing reservoir, which must therefore be higher than the highest house to be served. The intermittent supply was until lately employed everywhere in the metropolis; but it is universally admitted that the other system is vastly superior in every respect. The disadvantages of the intermittent practice have been strongly set forth in all the recent official reports on sanitary improvement; the expense of the erection and repair of cisterns, the trouble requisite to keep them clean, the contamination of the water by the neighborhood of sources of pollution, the frequent waste of water that occurs, the difficulties imposed on the poorer class of tenements where cisterns are not provided—are a few of the objections urged against this mode of supply. In a letter in the *Times*, January 3, 1866, Dr. H. Jeaffreson thus describes the condition, in regard to water-supply, of the centers of typhus infection in Lambeth, Southwark, Bethnalgreen, etc.: "Those houses the best supplied have each a butt, holding about 80 gallons, into which water flows from a stand-pipe for from ten minutes to half an hour each day, and is supposed to supply the wants of 20 persons for cooking, the washing of their persons, house, and linen, and for the rinsing down of the water-closets at such times as it may suit the caprice of any one of the inmates. At other places, a larger butt, but in relation to the number of persons proportionally smaller, supplies a whole court of ten or more three-roomed houses, which have no back yards, and a population of 150 people—members of 30 different families. On Sundays, even this supply is absent, the water of the day before is gone, and in many houses, that for the Sunday cooking has to be begged from neighbors who may have provided themselves with a larger butt, who are more provident or more dirty. More than nine-tenths of these water-butts have no covers; and fully half are so placed as to catch the drippings from the foul eaves of the houses, and are lined internally with scum and slimy vegetation."

One important advantage, arising from the constant system, is the ease with which water can be had in time of fires. The water being supplied at high-pressure, all that is necessary is to affix a hose to the water-plug in the street, when a jet corresponding in height to the pressure is obtained, which can be immediately directed against the fire.

The ratio of the supply to the population varies in different towns. In Edinburgh,

it is 47 gallons for each individual; in Glasgow, it is 50 gallons. This includes the water furnished to works of various kinds. The eight companies that supply London pour into the city and suburbs not much less than 100,000,000 gallons daily, which gives 206 gallons per house (including manufactories), or 26 gallons to each person. Notwithstanding this, owing to the neglect of the proprietors, "thousands of the poor get but little of it directly any day, and none at all on Sundays."

Cisterns, pipes.—Owing to the action of water on lead, already described, it is desirable to avoid the use of that metal in connection with very soft lake or river water. With regard to lead *pipes*, if the precaution is taken when the water has stood for any time in them, of allowing the first portions to run off before any is taken for use, little danger can arise; but either lead *cisterns* should be wholly avoided, or means taken to ascertain whether they contaminate the water; and if so, a remedy should be applied. There are various substitutes for lead as a lining for cisterns. Slate slabs are highly recommended. Gutta-percha is also found to be an easily fitted, cheap, and durable lining. For a few days, the water tastes of the naphtha used in applying the lining; but afterward, no kind of water, not even acids, have any action on the gutta-percha. Pipes of gutta-percha may also be used; they are cheap, and easily fitted up.

Common-wells.—The simplest of all water-supplies is that of a cottage or farmhouse in the country, with a good spring rising to the surface close by; and yet what a poor use is usually made of such a precious boon! The country well is generally a simple cavity to receive the spring, rudely lined, it may be, with stones, but with open mouth, into which dust and dead leaves are blown by every wind, and foul surface-water is trickling from all sides. Being exposed to the light, there is generally a profuse vegetation on the bottom and sides, and, in addition to these impurities, it is further muddled by the dipping in of buckets, often dirty on the outside. Who has not been disgusted, when asking a drink at a cottage, to get water thick with dust and visible impurities, knowing, at the same time, that it might be so easily remedied? A surface-spring should always be covered, and made to issue by a pipe, half a day's labor to create a fall, and a clay drain-tube, will generally convert a filthy puddle into a crystal fount. It is singular to see this blindness to the impurity of water in people otherwise cleanly enough. This is a subject worth the attention of country physicians and clergymen. The evil effects of drinking impure water are not confined to towns. May not the putrid sore throat and malignant fevers that often sweep away whole households in the country, especially in autumn, be partly owing to the cause now pointed at?

Deep wells should invariably be covered, and carefully protected from the infiltration of superficial ooze. The situation of pump-wells is often singularly ill chosen in this respect. See ARTESIAN WELLS.

WATER-TABLE, a set-off in a wall sloped on top to throw off the rain.

WATERTOWN, a t. in e. Massachusetts, Middlesex co., on the Charles river; pop. '80, 5,426. It is 6 m. from Boston, on the Watertown branch of the Fitchburg railroad, and is also connected with that city by a horse-railroad. It has 5 churches, public schools, a national bank, a savings bank, a public library, and a weekly newspaper. It contains a U. S. arsenal, and a part of the cemetery of Mount Auburn. It has handsome public buildings and many fine private residences. Its industries include the manufacture of paper, stoves, and Cardigan jackets.

WATERTOWN, capital of Jefferson co., N. Y., on the Black river, 86 m. n.w. from Utica, and 182 from Albany; has manufactories of cotton, woolen, flour, paper, iron castings, machinery, etc. An ice-cave extends partly under the village. Pop. in 1875, 10,041.

WATERTOWN (*ante*), a city in w. New York, incorporated 1869; pop. '70, 9,336. It is regularly laid out on both sides of the Black river, which is here 180 ft wide, and spanned by three bridges, one an iron suspension bridge. The river has a fall of 112 ft. in 2 m., affording valuable water-power. It is built 10 m. above the confluence of the Black river with lake Ontario, at the junction of the Rome, Watertown and Ogdensburg, and the Utica and Black River railroads, 250 m. n.w. of New York. It contains many fine private residences, a court-house, the county institutions, the county fair-grounds, the river park race-course, and a cemetery of 70 acres. It has an important trade in stock and grain. The leading industries are the manufacture of flour, 6 mills producing annually 200,000 barrels; of paper, 4 mills producing 3,600 tons of printing paper annually; of steam engines, sewing and knitting machines, paper bags, malt, etc. It has 4 national banks, with an aggregate capital of \$760,000; 2 state banks, with a capital of \$400,000, and a savings bank. It is lighted with gas, has 4 fire insurance companies, a fire department, and police force. It is supplied with water from 2 reservoirs 180 ft. above the level of the central square, having a capacity of 6,500,000 gallons. It has 10 churches and 5 newspapers.

WATERTOWN, a city of Wisconsin, on Rock river, and the Fond du Lac and Rock River railway, 40 m. e. by n. from Madison. The city is built on both sides of the Great Bend, where rapids with a fall of 24 ft. afford water-power for flouring and saw mills, foundries, and manufactories of agricultural implements, furniture, woolen mills, and potteries. Settled in 1836. Pop. in 1875, 9,524.

WATERTOWN (*ante*), a city in Jefferson and Dodge counties, Wis., on the Rock river, at the junction of the Chicago, Milwaukee and St. Paul, and the Chicago and North-western railroads; pop. '75, 9,524. It is on both sides of the Rock river, which is here crossed by several bridges. It is surrounded by a fertile country, and is the principal place in both counties. It is the seat of the Roman Catholic college of the Sacred Heart, organized in 1872, and of the North-western university, a Lutheran institution, founded in 1861. Watertown has a large trade, and growing manufactures of flour, beer, brick, lumber, chairs, etc. It became a village in 1849, and a city in 1853.

WATERVILLE, a village of Maine, on the right bank of the Kennebec river, at Ticonic falls, 82 m. n.w. from Portland. Around the falls are clustered saw-mills, plow, axe, hoe, and scythe factories, machine-shops, tanneries, etc. Waterville has a Baptist college, with 100 students, and library of 15,500 volumes, an academy, etc. Pop. in 1876, 4,000.

WATER VIOLET. See **HOTTONIA**.

WATER YAM. See **LATTICE LEAF**, *ante*.

WATERY GRIPES is the popular name for a form of serous diarrhea occurring in infants, in which there are copious discharges of thin watery motions, often limpid, or almost colorless, and occasionally intermixed with flakes or shreds. This form of diarrhea may be induced in weakly children by sudden impressions of cold on the surface, so as to check perspiration; or it may be brought on by cold drinks taken when the body is heated. The exhaustion brought about by the copious excretions from the bowels is sometimes so great that the case might be mistaken for one of cholera. On the occurrence of such an attack, the child should at once be wrapped up in warm flannel, placed in bed, with a bag of hot dry bran over the belly; and some arrowroot, with a little brandy, given frequently in teaspoonfuls or larger doses according to age; and the medical attendant should be at once sent for. If medical aid cannot be readily procured, opium must be carefully used to check the profuse evacuations. One of the best preparations is aromatic powder of chalk and opium, every 40 grains of which contain 1 grain of opium. From 3 to 5 grains of this powder, with a quarter of a grain of ipecacuanha, may be given, and repeated every three or four hours for two or three times, unless any head-symptoms (due to the opium) are perceived.

WATFORD, a market t. in the county of Hertford, on the banks of the Colne, 18 m. n.w. of London. Straw-plait is manufactured, and silk-spinning and malting are carried on; and there are two large paper-mills. Pop. 7,461.

WATKINS GLEN, in Schuylcr co., N. Y., a deep and rugged ravine ascending between two long ranges of low hills on the w. side of the Seneca Lake valley. It derives its name from the neighboring village of Watkins. Its course is nearly e. and w., and it rises 800 ft. in about 3 miles. The remarkable forms assumed by the river rocks, and the cascades on the falling stream make it one of the most charming of American glens, and it is visited annually by over 50,000 persons. Among the principal objects of interest are glen Alpha, the cathedral, the well, and Rainbow fall.

WATKINSON, DAVID, 1778-1847; b. Suffolk, England; educated by Mrs. Barbauld. In 1795 his parents came to this country and settled in Middletown, Conn. He engaged in business in New York city, and in 1841 retired with a large fortune. The rest of his life was spent in Hartford. By his will liberal legacies were given to several public institutions, the more notable being \$100,000 for the formation of the Watkinson library and \$40,000 each to the Hartford hospital and for the foundation of a juvenile asylum.

WATLING STREET, one of the great Roman highways of Britain, commencing at Dover, passing through Canterbury and Rochester to London, and thence through Uriconium and Chester to Caer-Seiont, the ancient *Segontium*, in Caernarvonshire. From Uriconium a branch proceeded n. by Manchester, Lancaster, and Kendal, into Scotland. Traces of the ancient road are still to be found in many parts of its course, and in some it is still an important highway. A street in London retains its name. The origin of this name is very uncertain; the most probable supposition is that the original name was *Stratum Vtulinum*.

WATLING ISLAND, one of the Bahamas (q. v.).

WATONWAN, a co. of s. Minnesota; 432 sq. m.; pop. '80, 5,104—3,039 of American birth, 4 colored. Co. seat, Madelia.

WATSON, ELKANAH, 1758-1842; b. Mass.; was sent at the age of 15 by John Brown, of Providence, a distinguished merchant to whom he was apprenticed, with 1½ tons of powder to Washington, at Cambridge; at 19 to Charleston and other southern ports with \$50,000, to be invested in cargoes for European markets; was bearer in 1779 of dispatches from the American government to Franklin, at Paris, by whose advice he opened a commercial house at Nantes; was very successful, but by the financial reverses in France lost most of his property; visited England and Holland; returned to Newport, 1784; settled in Albany, 1789, engaging in many public enterprises; settled in Pittsfield, Mass., 1807, devoting himself to agriculture; founded the Berkshire agricultural society; returned to Albany, 1816, and organized the first agricultural society in the

state; removed to Port Kent, lake Champlain. He published *A Tour in Holland; History of Agricultural Societies; History of N. Y. Canals.*

WATSON, HENRY COOD, 1816-75; b. London, Eng.; as a child, showed musical talent, and in 1829 appeared at the Covent Garden theater in Weber's *Oberon*. He became a musical critic and composer, in 1840 came to New York, and was connected with several of the journals of the day as art and musical critic, as well as a writer on other topics. In 1845, with Poe and Charles F. Briggs, he founded the *Broadway Journal*, which proved a failure financially, though conducted with ability. He was one of the founders of the Philharmonic society of New York, and had a chief share in organizing the notable Castle Garden Mendelssohn concert. In 1855 he founded *The Musical Guest*, and published many of his own compositions in its columns. Later he was editor-in-chief of *Frank Leslie's Illustrated Newspaper*; in 1862 started the *Art Journal*, and for the last 12 years of his life was the musical critic of the *New York Tribune*.

WATSON, JAMES CRAIG, 1838-80; b. Canada West, of American parents; graduated at the university of Michigan, 1857; a teacher there for some time of mathematics, and an assistant at the observatory; appointed prof. of astronomy, 1859, and of physics and mathematics, 1860; became director of the observatory in 1863; took charge of the observatory of the Wisconsin state university, 1877. He discovered many asteroids. He was at the head of the successful American expedition which observed the transit of Venus at Peking, China, 1874. He was awarded in 1870 the gold medal of the French academy of sciences for his various astronomical discoveries. He prepared many astronomical charts; was the author of a *Popular Treatise on Comets*, and a work on *Theoretical Astronomy*.

WATSON, JOHN, b. Ireland, 1807; emigrated to this country in 1810, removed to New York in 1818, and received the degree of M.D. at the college of physicians and surgeons in 1832. The next year he was appointed one of the physicians at the New York dispensary, of which he was an attending surgeon, 1839-62. He was one of the founders of the American and other medical associations. Among his works are *Thermal Ventilation and other Sanitary Improvements* (1851); and *The True Physician*.

WATSON, MUSGRAVE LEWTHWAITE, 1804-47; b. England; studied sculpture at London, at Rome, and under Chantrey. Among his works are statues of queen Elizabeth, of lord Nelson, lord Stowell, and lord Eldon. The statues for New college, Oxford, were executed by him after Chantrey's models.

WATSON, RICHARD, D.D., 1737-1816; b. England; graduated Cambridge, 1759; obtained a fellowship, 1760; ordained in the church of England; prof. of chemistry, 1764; tutor at Trinity college, 1767; regius prof. of divinity, Cambridge, and rector, Somersham, 1771; archdeacon of Ely, 1780; bishop of Llandaff, 1782. His chief works are *An Apology for Christianity, in a Series of Letters, addressed to Edward Gibbon, Esq.*; *Chemical Essays*; *A Sermon on the Wisdom and Goodness of God, in having made Rich and Poor*; *An Apology for the Bible, in a Series of Letters, addressed to Thomas Paine*; *Miscellaneous Tracts*.

WATSON, RICHARD, 1781-1833; b. England; was apprenticed at the age of 14 to a carpenter; joined the Methodists, 1796; ordained, 1800; became a member of the conference. After a few years he joined the Methodist new connection; was stationed at Manchester and Liverpool, and edited the *Liverpool Courier*; returned to the regular Wesleyan connection; was stationed in London; was one of the secretaries of the missionary society, and a teacher of theology to candidates for the ministry; was elected president of the conference in 1826. He published *A Defense of the Methodist Missions in the West Indies*; *Remarks on the Eternal Sonship of Christ*; and *Use of Reason in Matters of Religion*; *Theological Institutes*; *Conversations on Scripture for the Young*; *Biblical and Theological Dictionary*.

WATT, JAMES, mechanician, engineer, and man of science, famous as the improver, and almost the inventor of the steam-engine, was born at Greenock, in Scotland, Jan. 19, 1736. His father was a blockmaker and general merchant at Greenock, was long a member of the council of that burgh, and for a time a magistrate. Two members of James Watt's family—his grandfather and his uncle—had had some local reputation for scientific or engineering ability. The former was a teacher of mathematics, surveying, and navigation at Crawfordsdyke, near Greenock; the latter practiced as a land-surveyor and engineer with great success at Ayr. The grandfather, Thomas Watt, had been brought early in life to Lanarkshire from the neighborhood of Aberdeen, where his family had previously lived. The father of Thomas Watt, the great-grandfather of James, is said to have farmed a little property of his own in Aberdeenshire, and to have been killed while fighting on the side of the Covenanters against the marquis of Montrose.

James Watt was very weakly as a child, and being unable to go to school with regularity, he became, to a great extent, his own instructor. What schooling he did get, he got in the schools of his native town. He early manifested a turn for mathematics and calculations, and a great interest in machines, and accordingly—his father's business, for which he had been destined, having greatly declined—he was, at the age of 18, sent to London, to learn the trade of a mathematical instrument maker. Ill-health compelled

him to return home about a year after; but he had made good use of his opportunities in London; and on his health improving, he resolved to set up as a mathematical instrument maker in Glasgow. The incorporation of hammermen of that city put difficulties in his way; but the authorities of the university took him by the hand, appointed him mathematical instrument maker to the university, and gave him the use of premises within their precincts. He occupied these premises from 1757 to 1763. They seem to have been badly situated for his business, for which, moreover, at that time there was but little room in Glasgow; and Watt during those years was scarcely able to make a living. In 1763 he got a place of business in the town, and after that he did somewhat better; still, he had to eke out his income by making or mending fiddles (which he was able to do, though he had no ear for music), or doing any mechanical job which came in his way; and no work requiring ingenuity or the application of scientific knowledge seems to have come amiss to him. At length, in 1767, he fell upon a new and a more lucrative occupation. In that year he was employed to make the surveys and prepare the estimates for a canal projected to unite the Forth and the Clyde. This work could not be carried out at the time, because it failed to obtain the sanction of parliament; but Watt had now made a beginning as a civil engineer, and henceforth he got a good deal of employment in this capacity. He made surveys for various canals, for the improvement of the harbors of Ayr, Port-Glasgow, and Greenock, and for the deepening of the Forth, the Clyde, and other rivers. One of the tasks committed to him was to decide whether a projected canal between the firth of Clyde and the Western ocean should be made by way of Crinan or of Tarbert; and the last—also the greatest—undertaking of this kind on which he was employed was a survey for a canal between Fort William and Inverness; a work which has since been executed on a greater scale by Telford. In his surveys, he made use of a new micrometer, and of a machine, also of his own invention, for drawing in perspective—the latter of which appears to have been for several years about this time one of his sources of income. The reports which he drew up in the capacity of engineer are said to have been remarkable for perspicuity and accuracy.

Living in the college at Glasgow, in constant intercourse with the professors of the university, with access to books, and with much unemployed time on his hands—having, too, a great love of knowledge, and a lively interest in mechanical novelties—Watt had been a diligent student of science, and experimenter in the application of science to the arts. As early as 1759 his attention had been directed to the capabilities of steam as a motive-force by Mr. Robison (q.v.), afterward professor of natural philosophy in the university of Edinburgh, who was then a student in Glasgow. It had occurred to Mr. Robison that steam-pressure might be used to propel wheeled-carriages; but it does not appear that either Watt or he attempted to carry out this idea. In 1761 or 1762, however, Watt made a series of experiments on the force of steam, using a Papin's digester. These do not seem to have led to any results; and it was not till the winter of 1763-64 that he began the investigations which ended in his improvement of the steam-engine. During that winter a working model of the Newcomen engine, kept for the use of the natural philosophy class in the college, was sent to him to be put in repair. Watt quickly found out what was wrong with the model, and easily put it into order. But in doing this he became greatly impressed with the defects of the machine, and with the importance of getting rid of them. The Newcomen engine (see STEAM-ENGINE) was still but little used, and only for pumping water out of mines. It was a cumbersome machine, and it required so much fuel that the expense of working it had restricted, and must always have restricted its use. It was not a steam-engine at all. It was worked by means of the atmospheric pressure; steam being only used in producing by its condensation, a vacuum in a cylinder, into which—the vacuum made—a piston was depressed by the pressure of the air. The steam issuing from a boiler was admitted into the cylinder until it filled it, when the supply was cut off by a self-acting cock; and then the steam was condensed in the cylinder by means of a jet of water. The water so greatly cooled the cylinder that the greater part of the steam at each stroke of the piston was wasted in heating its walls; and on the other hand, much of the injected water was heated to the boiling-point, and gave off steam which resisted the descent of the piston. Watt found that about four-fifths of the steam, and consequently of the fuel, was wasted; and he saw that to make the machine work economically, two apparently incompatible conditions must be obtained—first, that the walls of the cylinder must constantly be of the same temperature as the steam which came in contact with them; and second, that the injected water must never be heated up to 100°, the boiling-point *in vacuo*. He now experimented upon the conducting power of various substances, and made trial of a cylinder made of wood steeped in oil; but with this cylinder, though it cooled less rapidly than a metallic one, there was still far too much waste of steam. Constantly, from the end of 1763, occupied with the subject of steam, he at length, early in 1765, hit upon the expedient which solved all his difficulties—the separate condenser, an air-exhausted vessel, into which the steam should be admitted from the cylinder and there condensed. The separate condenser at once prevented the loss of steam in the cylinder which had arisen in the process of condensation; and there was no difficulty in keeping it cool, so as to prevent the undue heating of the injection-water. He had now got a perfectly economical engine on Newcomen's principle, but he did not rest content with

this—he resolved to make steam his motive-power. Closing the cylinder at both top and bottom, and connecting the piston with the beam, to which it was to communicate motion, by a piston-rod passing through a stuffing-box, he admitted the steam by suitable valves alternately above and below the piston, to push it downward and upward in turn; and this done, his invention was substantially complete. He had at last made a real steam-engine, capable of being worked with a comparatively small expenditure of fuel, and of yielding any desired amount of power. Comparing his invention with the atmospheric engine of Newcomen, it must be admitted that it is not without justice that the popular voice has awarded him the name of inventor of the steam-engine.

Watt, soon after perfecting his model, formed a partnership with Dr. Roebuck, then of the Carron iron-works, for the construction of engines on a scale adapted to practical uses; and a model was erected at Kinneil, near Borrowstounness, where Dr. Roebuck then lived. But Roebuck got into difficulties; and nothing further was done until, in 1773, Watt entered into a partnership with Matthew Boulton of Soho, near Birmingham, when, Roebuck's interest having been repurchased, the manufacture of the new engine was commenced at the Soho iron-works. A patent for his invention had been taken by Watt in 1769. He got from parliament a prolongation of his patent for 25 years in 1775.

The advantages of the new engine were in no long time found out by the proprietors of mines; and it soon superseded Newcomen's machine as a pumping-engine. Watt afterward made numerous improvements in its construction (for the most important of which see STEAM-ENGINE); and in conjunction with his partner Boulton, he immensely improved the quality of the workmanship employed in building engines and other machines. In the years 1781, 1782, 1784, 1785, he obtained patents for a series of inventions—among them the sun-and-planet motion, the expansive principle, the double engine, the parallel motion, and the smokeless furnace, of most of which the chief purpose was to make steam-pressure available for turning machinery in mills. The accomplishment of this—extending the application of the new power to the arts—was of scarcely inferior importance to the invention of the steam-engine itself. The first contrivance invented by Watt for this purpose was lost to him through the treachery of a mechanic, who had been employed in making the model, who sold it to a manufacturer named Prickards, who got a patent for it for himself. The application to the steam-engine of the governor (see STEAM-ENGINE) was Watt's crowning improvement. He made numerous inventions unconnected with the steam-engine, several of which he patented, but they are all of minor importance.

He retired from business in the year 1800, giving up to his two sons his interest in the extensive and prosperous business which Boulton had created at Soho. He died at Heathfield in Staffordshire, on Aug. 25, 1819, in his 84th year. Watt was twice married: first in 1763, to his cousin, Miss Miller; and a second time shortly after his removal to Birmingham, to a Miss McGregor of Glasgow. He had a most extensive and accurate knowledge of the physical sciences—to several of which he made important contributions—and an almost unsurpassed fund of general information. (His claims to be considered the discoverer of the composition of water are considered in the article WATER.) He was elected a fellow of the Royal society of Edinburgh in 1784; a fellow of the Royal society of London in 1785; a corresponding member of the Batavian society in 1787; and in 1808, a corresponding member, and afterward a foreign member, of the institute of France. The university of Glasgow conferred on him the degree of LL.D. in 1806. His statue, the funds for which had been raised by a public and almost a national subscription, was erected in Birmingham in 1824; and his statue is now to be seen in the streets of many of our larger towns. The honor paid to his memory and to himself in his later years appear to have been deserved by his personal qualities, no less than by the immeasurable benefits which his inventive talents have conferred upon the human race.

WATTEAU, ANTOINE, was b. at Valenciennes, in the year 1684. In 1702 he betook himself to Paris, where for some time he worked as assistant to a scene painter. When this employment failed him, by the retirement of his master from Paris, he employed himself in copying pictures. The talent which he showed in this humble walk of the art drew the attention of Gillot, a popular painter of the day, who engaged him to assist in his studio. In no long time it was found that the pupil excelled his master, who speedily relinquished the field in his favor, and became an engraver. The success of Watteau was now assured; he was made a member of the French academy, and became by special favor *peintre de fêtes galantes du roi*. In 1718 he visited England, it is believed chiefly on account of his health, and to consult a certain Dr. Meade, then famous, for whom, during his stay, he painted one or two pictures. He remained about a year, without, as it should seem, much benefit. After his return home, his health gradually declined; and in 1721 he died at Nogent, near Paris.

In virtue of their charming color and graceful design, the pictures of Watteau continue to please, though his reputation as an artist is now but a faint echo of that which, in his lifetime, he enjoyed. He employed himself chiefly in painting small landscapes, with something of the nature of the *fête galante* going on in them—idylls in court-dress, which, as preserving for us the fopperies of the time, are not without a certain value distinct from their properly artistic one.

WATTERSON, HENRY, b. D. C., 1840; editor of the *Democratic Review* in 1858; removed to Tennessee in 1861, and was in the confederate army during the rebellion, except for one year, when he edited the *Chattanooga Rebel*. For a year after the war he was editor of the *Nashville Banner*. On the death of G. D. Prentice he became editor of the *Louisville Journal*, afterward consolidated with other papers, and called the *Courier-Journal*. He was elected to congress in 1876.

WATTLE. See ACACIA.

WATTLE-BIRD, *Anthocæra carunculata*, an Australian bird, of the family of honey-eaters (*meliphagida*). It is about the size of a magpie, grayish brown above, each feather striped, and bordered with white; the tail brown, long, wide, and graduated. It derives its name from a pendulous reddish wattle on each side of the throat. It feeds chiefly on honey and insects extracted from the flowers of *banksias*, these trees continuing in flower most of the year. It is a bold and active bird, and drives away all other birds from the part of the tree which it occupies.

WATTS, GEORGE FREDERICK, b. London, Eng., 1820. His first large oil-paintings, "Echo," and "Alfred inciting the Saxons to Maritime Enterprise," received a prize of £500 at the Westminster hall competition of 1843, and were placed in the then new houses of parliament, for which he also painted "St. George overcoming the Dragon." In 1867 he became an associate of the Royal academy. He has executed several large fresco designs of merit, the best being that in Lincoln's Inn hall, representing the law-givers of different ages and races.

WATTS, ISAAC, was b. on July 17, 1674, at Southampton, where his father had a boarding-school. He was educated at the grammar-school of his native place, and afterward sent, at the age of 16, to an academy in London, kept by Mr. Thomas Rowe, an Independent minister. Here his devotion to his studies was so excessive as to permanently injure his constitution. In 1696 he became tutor in the family of sir John Harbott, at Stoke-Newington, with whom he remained six years. During the latter part of this time he officiated as assistant to Dr. Chauncey, minister of the Independent church in Mark lane, to whose post he succeeded in 1702. His health was throughout infirm; and in 1712 he was prostrated by an illness so violent that he never thoroughly recovered from its effects, though he lived for many years afterward. A visit which he paid to sir Thomas Abney, at Theobalds, for change of air, resulted in his domestication in the establishment till his death, 36 years afterward, on Nov. 25, 1748. As his health permitted, he continued to discharge his clerical duties, and to occupy himself with literary pursuits. His theological works were numerous, but are now quite forgotten. His treatise on *Logic*, though long since superseded, had in its day a considerable reputation, and was adopted as a text-book by the university of Oxford. By his well-known hymns for children, his reputation has been chiefly perpetuated. So lately as 1837 his *Horæ Lyricæ* were republished, with a memoir by Southey. In Johnson's *Lives of the Poets*, a notice of him is likewise to be found.

WATTS, ISAAC, D.D. (*ante*), is distinguished even more for his religious poetry than for his theological works. "He was," says Montgomery, "almost the inventor of hymns in our language." His poetical works are: *Horæ Lyricæ; Hymns and Spiritual Songs; Psalms of David in the Language of the New Testament; Divine and Moral Songs for Children*. His psalms and hymns were long used exclusively in the churches, and many of them are found in all modern church collections. A complete collection of his works was published by Drs. Jennings and Doddridge, 6 vols. 4to.

WATTS, JOHN, 1749-1836, b. N. Y.; recorder of New York. He was a member of congress, 1793-96; and judge of Westchester co., 1802-6. He founded an orphan asylum in New York. His father John (1715-89) was an extensive land-holder, who served for many years in the legislature, and in the council. He married a sister of James De Lancey, the governor of New York, was a partisan of the royalists, and left the colony for England in 1775. His estates were confiscated, but a part of them was restored to his sons.

WATTS, THOMAS, a distinguished philologist and librarian, was b. in London early in the present century. At school he studied Latin and French, and in due time Greek as well; but he principally distinguished himself by his attainments in English. He read every book that came in his way, and he wrote, apparently with the utmost ease, tales, essays, and poetry, very much above the average, not alone of school-boy composition, but of the magazine-writing of the day. To a knowledge of the classics and French, Watts soon added an acquaintance with the other languages of the Latin family—as Italian, Spanish, and Portuguese; likewise with the German, Dutch, Swedish, Danish, and Icelandic. The facility with which he acquired these several languages, encouraged him to undertake, from time to time, the study of some of the oriental tongues, viz., Hebrew, Arabic, Persian, Turkish, and even Chinese. In each of these he made considerable progress, but cannot be said to have mastered any of them as he did those languages before named, and as he subsequently mastered the Russian, Polish, and Hungarian. There are few Englishmen who know anything of the three languages last named, which Watts could read and translate with the utmost ease—being as familiar,

In fact, with their great writers as he was with those of Germany or France. It remains only to mention that Watts was also well acquainted with the Welsh language and literature, besides having some knowledge of the Gaelic and Irish as well. Upward of 20 languages have thus been named with which he was well acquainted. No other Englishman has approached him as a linguist, considering the *variety* as well as the *number* of languages which he acquired; while of foreigners, it is not too much to say that Mezzofanti alone appears to have surpassed him.

In 1832 Watts first became a "reader" in the reading-room of the British museum, where, in studying some of the languages mentioned, he became acquainted with the deficiencies in the literature of other countries under which our national library then labored. In 1837 the rev. Mr. Baber, then keeper of the printed books, purchased, at his recommendation, a small collection of Russian books, which Watts offered to catalogue as a volunteer. This brought him the acquaintance of Mr. Panizzi, who, becoming aware of his attainments, recommended him for employment in the library. Accordingly, he was engaged as an assistant in the department of printed books, Jan., 1838. At that time, the books were being transferred from the old rooms in Montague house to the new library. It was Watts's duty to assist in the rearrangement of the books, and when this was finished, he was intrusted with the responsible duty of arranging and placing on their shelves, according to subjects, all the new works purchased or otherwise acquired for the library. For this his vast acquirements as a linguist eminently qualified him. In other respects also his knowledge of languages was brought to bear in the service of the museum. He drew up lists of desiderata in all the languages of Europe. It was at his suggestion also that the first large orders were given for American books. "The object" (says Watts in a letter to the principal librarian in 1861, printed by order of the house of commons in 1866) "which has been kept in view during the last three-and-twenty years has been to bring together from all quarters, the useful, the elegant, and the curious literature of every language; to unite with the best English library in England or the world the best Russian library out of Russia, the best German out of Germany, the best Spanish out of Spain, and so for every language from Italian to Icelandic, from Polish to Portuguese. In five of the languages in which it now claims this species of supremacy, in Russian, Polish, Hungarian, Danish, and Swedish, I believe I may say that, with the exception of perhaps fifty volumes, every book that has been purchased by the museum within the last three-and-twenty years has been purchased at my suggestion. I have the pleasure of reflecting that every future student of the less known literatures of Europe will find riches where I found poverty." The number of books classified and arranged by Watts, while only an assistant in the library, is reckoned at about 400,000 volumes, and of these as many as 100,000 were arranged upon a plan of his own invention, now known as "the elastic system." "One of the advantages," he says, in the letter before mentioned, "obtained by this system is, that when the new library, which surrounds the new reading-room, was ready for the reception of books, these 100,000 volumes were removed to their new locality without the necessity of altering a single press-mark: had the operation of altering the press-marks been still required, as under the former system, the amount of labor necessary to effect it would have been enormous, and the expense not less than some thousands of pounds." Here it may be mentioned that it was Watts who first suggested the erection of a library and large reading-room in the vacant quadrangle, where now rises the splendid dome erected under the auspices of Panizzi. The suggestion was originally made in a series of articles contributed anonymously to the *Mechanics' Magazine* for 1836 and 1837, since that time acknowledged by Watts as his own. In one of these, speaking of the quadrangle, he says: "The space thus unfortunately wasted would have provided accommodation for the whole library. A reading-room of ample dimensions might have stood in the center, and been surrounded on all four sides by galleries for the books, communicating with each other, and lighted from the top." In 1856 Watts was promoted to be assistant-keeper of the printed books; and on the opening of the splendid new reading-room in 1857, he was most fitly appointed its superintendent. In Aug., 1866, Watts was appointed keeper of the department of printed books. He died Sept. 9, 1869. Watts was a member of the philological society of London; he was also an honorary member of the Hungarian academy, to which he was elected at the same time as the late lord Macaulay. Among the literary productions of Watts may be mentioned: "Notes of a Reader," contributed to a weekly periodical entitled *The Spirit of Literature*, 1830; numerous poetical pieces contributed to Linnington's *Rhetorical Speaker and Poetical Class-Book*, 1833; *A Letter to Antonio Panizzi, Esq., on the reputed Earliest Printed Newspaper*, "The English Mercurie, 1588," 1839; *A Sketch of the History of the Welsh Language and Literature* (reprinted from Knight's *English Cyclopædia*), 1839; more than a hundred biographies of eminent men, Russian, Hungarian, Bohemian, etc., contributed to the same *Cyclopædia*; numerous articles in the *Biographical Dictionary* of the society for the diffusion of useful knowledge; papers in the *Transactions of the Philological Society*, among which are an "Essay on the Hungarian language," and a biographical notice of cardinal Mezzofanti; also contributions to the *Quarterly Review*, the *Athenæum*, and other literary periodicals.

WAT TYLER. See TYLER INSURRECTION, *ante*.

WAUKEGAN, a city and port of Illinois, on the w. shore of lake Michigan, 35 m. n. by w. from Chicago, and 50 m. s. of Milwaukee, connected with both by railway. The town is handsomely built on a bluff, 50 ft. above the lake, and has 9 churches, an active trade, and is becoming a summer resort. Pop. '75, 5,500.

WAUKESHA a co. in s.e. Wisconsin; 576 sq.m.; pop. '80, 28,957—20,273 of American birth, 64 colored. Co. seat, Waukesha.

WAUKESHA, a t., the co. seat of Waukesha co., Wis., on the Fox river, and the Chicago, Milwaukee and St. Paul railroad; pop. about 5,000. It has churches, schools, hotels, banks, 3 newspapers, and a court-house. Carroll college and the state industrial school for boys are situated here.

WAUPAKA, a co. in e. Wisconsin; 720 sq.m.; pop. '80, 20,954—15,063 of American birth, 20 colored. Co. seat, Waupaka.

WAUSHA'RA, a co. in central Wisconsin, bounded on the s.e. by Fox river; 648 sq.m.; pop. '80, 12,688—9,907 of American birth, 32 colored. Co. seat, Wautoma.

WAVE, the name given to a *state of disturbance* propagated from one set of particles of a medium to the adjoining set, and so on; sometimes with, sometimes without, a small permanent displacement of these particles. But the essential characteristic is, that energy (see **FORCE**), not matter (q.v.), is on the whole transferred. The theory of wave-motion is of the utmost importance in physical science; since, besides the tide-wave, waves in the sea, in ponds, or in canals, undulations in a stretched cord (such as a piano-forte wire), or in a solid (as sound-waves or earthquake-waves), we know that sounds in air are propagated as waves (see **SOUND**), and that even light (see **UNDULATORY THEORY**) is a form of wave-motion.

The general investigation of the form and rate of propagation of waves demands the application of the highest resources of mathematics; and the theory of even such comparatively simple cases as the wind-waves in deep water (the Atlantic roll, for instance), though easily enough treated to a first, and even to a second and third approximation, has not yet been thoroughly worked out, as fluid friction has not been taken account of. In this article, therefore, we will merely *state* some of the more important conclusions which mathematical analysis has established in the more difficult of these inquiries, comparing them with the observations of Scott Russell and others; while we give at full length the very simple investigations of the motion of a wave along a stretched cord, and of the propagation of a particular kind of sound-wave.

To find the rate at which an undulation runs along a stretched cord, as for instance, when a harp-string is sharply struck or plucked near one end, a very simple investigation suffices. Suppose a uniform cord to be stretched with a given tension in a smooth tube of any form whatever, we may easily show that there is a certain velocity with which the cord must be drawn through the tube in order to *cease to press on it at any point*, that is, to move independently of the tube altogether. For the pressure on the tube is due to the tension of the cord; and is relieved by the so-called centrifugal force (see **CENTRAL FORCES**) when the cord is in motion.

If T be the tension of the cord, r the radius of curvature of the tube at any point, the pressure on the tube per unit of length is

$$\frac{T}{r}.$$

If m be the mass of unit length of the cord, v its velocity, the centrifugal force is

$$\frac{mv^2}{r}.$$

These are equal in magnitude, and so destroy each other, if

$$T = mv^2.$$

Hence, if the cord be pulled through the tube with the velocity thus determined, there will be no pressure on the tube, and it may therefore be dispensed with. If we suppose the tube to have a form such as that in the figure, where the extreme portions are in one



FIG. 1.

of the cord will appear to be at rest, while an undulation of any definite form and size whatever runs along it with velocity v , in the opposite direction. This is a very singular case, and illustrates in a very clear manner the possibility of the propagation of a *solitary wave*.

To a spectator moving in the direction of the arrow with velocity v , the straight parts

Thus we have proved that the velocity with which an undulation runs along such a cord is

$$\sqrt{\frac{T}{m}}$$

If l be the length of the cord in feet, w its whole weight, W the appended weight by which it is stretched, $g = 32.2$ ft., the measure of the earth's gravity, this becomes

$$\sqrt{\frac{W}{w} \cdot \frac{1}{g}}$$

This formula is found to agree almost exactly with the results of experiment. We can easily see why it should be to some small extent incorrect, because we have supposed the cord to be inextensible, and perfectly flexible, which it cannot be; and we have neglected the effects of extraneous forces, such as gravity, the resistance of the air, etc.

Let us next consider the motion of air in a cylindrical tube, in the particular case in which the leg of a vibrating tuning-fork is applied at one end. This is a simple case of the propagation of sound-waves. We shall treat it by a synthetical process, somewhat like that given by Newton.

As we have already seen (see PENDULUM), a simple vibration such as that of a pendulum or tuning fork is the resolved part, in a definite line, of the uniform motion of a point in the circumference of a circle. What we have now to show is, that such a motion of all the particles of air in the pipe, the *phase* of the vibration (or the position of the particle in its path at any instant) depending on its distance from the end of the tube, is consistent with mechanical principles. When this is done, it will be easy for us to trace, in this particular example, the process by which the wave is propagated from one layer of the fluid to the next. We must now consider (a little more closely than in PENDULUM or SOUND) the nature of the simple vibration of each particle of the air.

Suppose P to move, with uniform velocity V , in the circle APB , and let PQ be drawn perpendicular to the fixed diameter, OA , then the acceleration of P 's motion is $\frac{V^2}{OA}$ in the direction PO . Hence in the motion of Q , which is a simple vibration, we have, by the rule for resolving velocities and accelerations (see VELOCITY),

$$\text{Velocity of } Q = \frac{PQ}{OA} V \text{ in the direction } QO;$$

$$\text{Acceleration of } Q = \frac{OQ}{OA} \frac{V^2}{OA} \text{ in the direction } QO.$$

Next consider two particles of air near one another in the axis of the tube, or the masses of air in two contiguous cross-sections of the tube. If the phase of vibration were the same for both they would be *equally* displaced from their original positions and the air between them would be neither compressed nor dilated.

Hence, that a wave may pass, the phases must be different. Let, then, Q represent the position of the one particle, or layer, in its line of vibration at any instant; Q' , the simultaneous position of the other. The first will be displaced through a space OQ from its position of rest; the second, through a space OQ' ; and their distance will therefore be altered by the amount QQ' , which may be taken to represent the compression or dilatation. But it is easy to see that, as P and P' move round, QQ' is always proportional to PQ . Hence the compression or dilatation of the air in any cross-section of the tube is proportional to the velocity with which it is moving. Hence the difference of pressures before and behind any such section is proportional to the difference of velocities—i.e., to the acceleration of the motion while the section passes over a space equal to its own thickness. And this is consistent with mechanical principles, for the *mass* of air in the section is constant, while the difference of pressures before and behind produces the acceleration, and should therefore be proportional to it. The particles of air in cross-sections of the tube therefore vibrate, each in the same period as does the tuning-fork, but the phase is *later* for each section in proportion to its distance from the fork. Where the phase is one or more whole vibrations later than that of the fork, the motion is exactly the same as that of the fork, and *simultaneous* with it. At all other points, it is the same as that of the fork, but not simultaneous. Thus the greatest displacement of the fork is immediately shared by the layer next it, later by the next layer, and so on. Thus, a *wave* of displacement travels along the tube from one section to the next, while each particle merely oscillates backward and forward through (in general) a very small space about its position of rest.

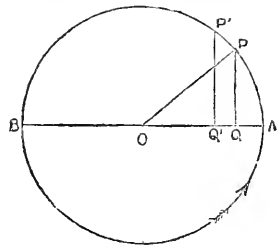


Fig. 2.

The reader who has followed the little geometrical investigation above will have no

difficulty in proving for himself that the velocity with which the wave travels is proportional to

$$\sqrt{\frac{p}{\rho}},$$

where p is the pressure, and ρ the density of the air. The easiest mode of doing this is to express, in terms of these and other quantities, the equation given us by the laws of motion,

$$\text{Mass} \times \text{Acceleration} = \text{Difference of pressures},$$

and to assume that Hooke's (q.v.) law holds, even during the *sudden* compression of air. This, we know, is not the case; so that a correction has to be applied to the above expression; depending on the heat developed by sudden compression or lost in sudden rarefaction, by each of which the elastic force of the air is *increased*. But this has been already discussed in SOUND.

The above formula shows us, however, that the velocity of sound is not affected by the pressure of the air—i.e., the height of the barometer—since, in still air, p is *proportional to* ρ . The velocity does depend on the temperature, being, in fact, proportional (*ceteris paribus*) to the square root of the temperature measured from absolute zero. See HEAT.

We see also from the formula that the velocity is inversely as the square root of the density of the gas—the pressure being the same. Thus a sound-wave travels about four times faster in hydrogen than in air.

Also we see that, within the limits of approximation we have used, the velocity does not depend upon the intensity, pitch, or quality of the sound (q.v.). The investigations which seem to lead to slight modifications of this conclusion are too recondite to be introduced here. We can only mention, also, the beautiful investigations of Stokes (q.v.) connected with the extinction of a sound-wave as it proceeds, partly by fluid friction, partly by radiation. And we may conclude by stating that the result of a completely general investigation of the velocity of a sound-wave gives, to a first approximation, the result we have deduced from the study of a simple particular case.

We now come to the consideration of waves in water. Of these, there are several species. One, however, we may merely mention, as its theory is the same as that just briefly discussed. This is a sound-wave, or *wave of compression*, in water. Its velocity is considerably greater than that of sound in air (see SOUND). The others, which are commonly observed on the surface of water, depend on mere changes of level, and their effects; and in studying them, we may consider water as incompressible.

The first of these is what is called a *long* or *solitary* wave. Its essential characteristic is, that its length is great compared with the depth of the liquid in which it moves. To this class belong the tide-wave (see TIDES), and the long wave which accompanies a canal-boat, and which we see slowly traversing the canal when the boat is stopped. Scott Russell has made many interesting observations on this wave, all of which accord well with the results of the mathematical theory of its propagation. The velocity of this wave depends solely on the depth, not on the density of the liquid in which it moves—and in a uniform canal the velocity is that which would be acquired by a stone falling freely through a space equal to half the depth of the water. Another characteristic of this wave is that, after it has passed, it leaves the water bodily transferred through a small space along the bed of the canal—forward or backward, according as it consists of an elevation or a depression of the water-surface. Scott Russell has shown that the most favorable rate at which a canal-boat can be drawn is when its velocity is such that it rides on the crest of the solitary wave. If drawn at any other speed, it leaves the solitary wave behind, or is left by it; and in either case, part of the horse's work is expended in producing fresh solitary waves. An excellent mode of observing these waves is to tilt slightly a rectangular box containing some water, and restore it to its original position. A long wave is thus formed, which is reflected repeatedly at the ends of the box, and whose rate of motion may be accurately observed by watching the image of a candle reflected at the surface of the water. If the sides of the box be made of glass, and some light particles be dispersed through the water, their motions enable us to discover all the circumstances of the propagation of this wave.

We next come to what are called *oscillatory* waves in water or other liquids. To this class belong all waves whose length from crest to crest is small compared with the depth of the liquid; from ripples on a pool to the long roll of the Atlantic. They are never observed as solitary waves, their general characteristic being their periodical recurrence. And, by watching a piece of cork floating on the surface, we see that it moves forward when at the crest of the wave, and backward through an equal amount when in the trough. Also it rises while passing from the trough to crest, and sinks from crest to trough. Mathematical investigation, confirmed by experiments with floats at sea, and with short waves in the glazed box before described, shows that each particle of the water describes a *circle* about its position of rest in the vertical plane in which the wave is advancing. Particles at greater and greater depths describe smaller and smaller circles. The diameters of these circles diminish with extreme rapidity. At a depth equal to the distance from crest to crest (i.e., the length of the wave), the displacement

of the water is already only $\frac{1}{533}$ of that at the surface. At the depth of two wave-lengths, it is about $\frac{1}{33000}$ of that at the surface. Thus we may see to how small a depth the ocean is agitated even by the most tremendous wind-waves; for, according to Scoresby, 43 ft. is about the utmost difference of level between crest and trough in ocean-waves. If the wave-length be 300 ft. (which is a large estimate), then at a depth of 300 ft. the water-particles describe circles whose radii are only the $\frac{2}{333}$ of a foot, or about four-tenths of an in.; and at 600 ft. this is reduced to $\frac{1}{1200}$ of an in.; while the depth of the Atlantic is in many parts more than three or four miles. In this case, the velocity of propagation of the wave has been shown to be

$$\sqrt{\frac{gl}{2\pi}}$$

where g is, as before, 32.2 ft.; l is the wave-length in feet; and π is the ratio of the circumference of a circle to its diameter (see QUADRATURE OF THE CIRCLE). Thus the velocity of an oscillatory wave in deep water is proportional to the square root of its length. This fact has been of use as an analogy in helping us to account for the *dispersion* (see REFRACTION) of light, where, by experiment, we know that the waves of red light are longer than those of blue light, and also that they travel faster in refracting media.

When the depth is not infinitely great compared with the length of a wave, theory and experiment agree in showing that the motion of each particle takes place in an ellipse whose major axis is horizontal. These ellipses diminish rapidly in length as we descend in the liquid, but still more rapidly in breadth; so that, as was to be expected, the particles at the bottom oscillate in horizontal straight lines. The expression for the velocity of propagation is now by no means so simple as in the previous cases—but is easily shown to include the values already given.

So far, the first approximation. A section of the surface made by a vertical plane in the direction of the wave's motion, is shown to be bounded by the *harmonic curve*, or curve of *sines*, the form assumed by a vibrating string (see SOUND); from which it follows that the crests are similar to the troughs. The second approximation makes the troughs flatter, and the crests steeper, and also shows that the particles are, on the whole, carried *forward* by each successive wave. The amount of this progression diminishes rapidly with the depth below the surface. A third approximation shows that the velocity is, *ceteris paribus*, greater the greater is the height of the waves.

When waves advance toward the shore, their circumstances change, in general gradually, from those of oscillatory waves to those of waves of translation, as the depth of the water becomes less and less considerable in comparison with the length of the wave; and it is found by experiment that they “break,” as it is called, when the depth of the water is about equal to the height of the crest above the undisturbed level. All the curious phenomena of breakers are thus easily explained by the results we have already given, when they are considered with reference to the gradual alteration of the depth of the water.

Finally, we must notice a singular phenomenon often observed, viz., that of a series of waves breaking on the coast, every eighth, or ninth, or tenth, etc., is seen to be higher than its predecessors or successors. The explanation is simple enough, and points to the simultaneous existence of two or more sets of oscillatory waves of different lengths, due in general to quite distinct causes, which reach the shore together.—For further information on this subject the reader is referred to papers by Stokes in the *Cambridge and Dublin Math. Journal*, vol. iv., and the *Cambridge Phil. Trans.*, vol. viii., and to Airy's “Tides and Waves” in the *Encyclopædic Metrop.*

This might lead us to consider the very interesting case of “Co-existence of Small Motions” presented by the interference (q.v.) of such waves; but we have already in various articles (see POLARIZATION, SOUND, UNDULATORY THEORY) given sufficient examples to illustrate the great principle.

There remains the consideration of the propagation of waves in elastic solids, among which, at least so far as luminiferous vibrations are concerned, it appears that the ether (q.v.) must be ranked. This is a subject of a higher order of difficulty than any of these before mentioned, and, in the case of light at least, has not yet been treated in a thoroughly satisfactory manner, though such men as Cauchy, Neumann, Maccullagh, Green, and Stokes have written profound memoirs upon it.

WAVRE, a t. in the province of South Brabant, Belgium, 15 m. s.e. of Brussels, has a pop. of 5,900, who are mostly engaged in the manufacture of hats, leather, and cotton-yarn. Wavre is better known as the scene of a desperate and protracted conflict between the French and Prussians, on June 18-19, 1815. The former, under Grouchy, Gerard, and Vandamme, advanced against the Prussians at the same time as Napoleon directed the troops under his immediate orders against Wellington at Waterloo (q.v.) and being much superior in number (32,000 to 15,200), drove the Prussians, under Thielman, into Wavre, where they defended themselves with desperate firmness, repulsing 13 different assaults in the course of the 18th. On the following morning, Thielman, who had heard of the victory at Waterloo, attacked Grouchy, but was repulsed with vigor, though the urgent orders of Napoleon forced the latter to retreat to Laon, instead of following up his success.

WAX. Under this term, chemists include various matters of a well-known (so-called *waxy*) appearance, derived both from the animal and the vegetable kingdoms. While in their general relations they approximate to the fats, they differ materially from the latter in their chemical composition; those of them which have been carefully examined, being found to consist partly of mixtures of alcohols and compound ethers, and partly of free fatty acids. Their general properties may be thus laid down: They are solid or semi-solid matters; are easily broken when cold, but at a moderate warmth are soft and pliable, and fuse at a temperature below 212°. They have a peculiar glistening appearance, are lighter than water, are insoluble in that fluid and in cold alcohol, but dissolve readily in ether; they are combustible, and burn with an illuminating flame, are non-volatile, and when heated in a free atmosphere, undergo decomposition. In this category are included spermaceti (which has been already considered), bees-wax, Chinese wax, and other less known kinds, as palm or vegetable wax (obtained from the bark of *Cerroylon andicola*, by the action of hot water and pressure), Carnaluba wax (an exudation from the leaves of a Brazilian palm), sugar-cane wax, etc.

Bees-wax is an animal secretion formed by the bees from sugar, and constitutes the material of which the cells of the honey-comb are composed. It is obtained by expressing the honey, and fusing the residue in boiling-water. In this state it is of a yellow color (*cera flava*). It may be bleached, so as to form white wax (*cera alba*), by being exposed in thin slices to the action of solar light, or by the action of nitric acid. (Chlorine readily destroys the color, but renders the wax unfit for candle-making, as a portion of the hydrogen of the wax is replaced by chlorine, and the candles, when burning, evolve irritating vapors of hydrochloric acid gas.) From the researches of sir B. Brodie (*Phil. Trans.*, 1848-49), it appears that wax consists of three different substances, *myricin*, *cerin*, and *cerotin*, which are separable from one another by means of alcohol. *Myricin*, which is insoluble in boiling alcohol, constitutes more than two-thirds of the bulk of ordinary wax. *Cerin*, or *cerotic acid*, which dissolves in boiling alcohol, but separates on cooling, varies in quantity in different specimens. In one sample of genuine bees-wax, Brodie found that it constituted 22 per cent, and it was always present in European samples, while in Ceylon wax it was entirely absent. This curious variation in the nature of an animal secretion, under different conditions of life, resembles the variations sometimes noticed in the acids of butter, in which the butyric and caproic acids of one season are replaced in another by vaccinic acid, differing from the former acids in the amount of oxygen alone. *Cerotin*, the substance soluble in cold alcohol, is a greasy body, constituting 4 or 5 per cent of ordinary wax. Without entering into chemical details, we may observe that bees-wax yields the following derivatives: Cerotic acid or cerin, $\text{HO.C}_{53}\text{H}_{102}\text{O}_2$; ceryl alcohol or cerolin, $\text{HO.C}_{54}\text{H}_{104}\text{O}$; melissylic alcohol or melissin, $\text{HO.C}_{60}\text{H}_{122}\text{O}$; melissic acid, $\text{HO.C}_{60}\text{H}_{120}\text{O}_2$; palmitic acid, $\text{HO.C}_{32}\text{H}_{64}\text{O}_2$; myricin, $\text{C}_{52}\text{H}_{104}\text{O}_2$; and melene, $\text{C}_{60}\text{H}_{120}$.

Chinese wax ($\text{C}_{100}\text{H}_{198}\text{O}_4$) is supposed to be the produce of a species of insect of the coccus family, and consists principally of cerotic acid, in combination with oxide of cerotin.

Both yellow and white bees-wax occur in the Pharmacopœia. The characters and tests, as given in that work, are—*Of yellow wax*: "Firm, breaking with a granular fracture, yellow, having an agreeable honey-like odor; not unctuous to the touch, does not melt under 140°, yields nothing to cold rectified spirit, but is entirely soluble in oil of turpentine; boiling water in which it has been agitated, when cooled, is not rendered blue by iodine." *Of white wax*: "Hard, nearly white, translucent; not unctuous to the touch, does not melt under 150°." The iodine test is used because wax is often adulterated with starch. Wax was formerly much employed internally as an emollient medicine, in cases of suspected ulceration of the intestines. At present it is only used as an external agent, being an ingredient of many ointments and plasters.

The commercial value of bees-wax is very great; and if it were possible to ascertain the total of the quantity produced, it would cause great surprise at the amount of valuable material derived from a source apparently so insufficient. Its chief uses are for candles, modeling, medicinal cerates or ointments, besides many minor purposes. Nearly 500 tons are annually imported into Great Britain, the value of which is about £80,000; but so large is the quantity consumed in the ceremonies of the Greek and Roman churches, that Russia alone consumes more than four times that amount, and the various Catholic countries probably ten times as much. The INSECT WAX of China, or Pe-la, has lately been imported in small quantities, and used in the manufacture of candles by Messrs. Price & Co.; but it is far too costly for general use (see WAX INSECT). In China, this wax is very highly valued, and is so costly as to be used only by the highest classes; it is white, and breaks with a crystalline fracture and pearly luster. Of vegetable wax, there are four distinct kinds known in commerce. The first in importance is the JAPAN WAX, which is almost as white and compact as refined bees-wax, which it closely resembles; it was first brought to Great Britain in 1859, and since then, some very considerable importations have taken place. It is said to be obtained by boiling the seeds of a species of *Rhus* (*R. succedanea*). It has only been used in making candles. BRAZILIAN VEGETABLE WAX is also an article of regular importation, but only in small quantities; it is obtained from the leaves of *Corypha cerifera*, the carnaluba palm of the Brazilians. It forms a glossy varnish-like covering; and when the leaves

are gathered, and begin to shrink from withering, it cracks and peels off, and is collected and melted into masses. It is hard and brittle, and of a dull yellow color. The candle-makers have used it for mixing and improving other materials. In Brazil, candles are wholly made of it, or half the quantity of stearine is added. The **VEGETABLE WAX** of the Andes is also yielded by a palm (see **WAX PALM**). Although much used in Mexico, it has not yet become of commercial importance to Europe. It is chiefly used for candles in the churches. **MYRTLE WAX**, though rarely seen in Europe, is much used in the British colonies of North America and the United States, and at the cape of Good Hope; it is also in use in Brazil. It is procured by boiling the berries of *myrica cerifera* in North America, and probably from other species in Brazil, and at the cape of Good Hope. It resembles bees-wax very much, except that it has a greenish yellow instead of a yellow color. It is only used for candle-making. See **CANDLEBERRY**.

Of the manufactured compounds called wax, the following are the chief—viz., sealing-wax (q.v.). **MODELERS' WAX**, used by artists for modeling small works. It consists of equal parts of bees-wax, druggists' lead-plaster—olive oil and yellow resin—and just sufficient whiting added to produce the consistency of putty. **GILDERS' WAX** consists of four parts of bees-wax, well mixed by melting with one part each of verdigris and sulphate of copper.

The bees-wax of commerce is of a dirty yellow color, and mixed with many impurities. It has, consequently, to undergo a process of bleaching, by which it is rendered quite white and pure. The usual process is to melt the wax with boiling water, and stir them together for a short time, so as to separate the impurities from the wax. It is then allowed to rest for a short time, and the pure wax floats on the top; and when cold, is taken off in a cake, the lower part of which is often discolored with the dirty water. This is scraped off and mixed with the next lot to be operated upon. The purified portion is next remelted, and is then allowed to trickle from the melting-pan on to a wooden cylinder, revolving rapidly, and partly immersed in pure cold water, in a large cistern. This throws it into the water in the form of fine, thin, feather-like flakes, which cool and harden instantly in the water. When all is run off, the wax is removed from the water, and laid on linen cloths, placed on tables in a field for the air to bleach. From time to time, the flakes are turned over and examined; and when the bleaching effect of the air seems to have stopped, the wax is remelted, and converted into flakes in the cistern, and replaced in the bleaching-ground until it is quite white.

WAX. MINERAL, is a natural product known under the name of ozokerit. It used only to be found in small quantities oozing from rocks of coal formation, though near Edinburgh, candles, as curiosities, were made of it by the miners. Lately, however, immense deposits of the hydrocarbon have been found in several parts of Europe, chiefly in Galicia and Moldavia, and it has now become a commercial article for the manufacture of candles. When found, it has a dark, rich-brown color, slightly greenish and translucent in thin films; but when refined, it resembles well bleached bees-wax. Its melting-point is about 60°.

WAX-CLOTH, a name sometimes given, but very erroneously, to floor-cloth (q.v.).

WAX-FLOWERS. An elegant use is found for bees-wax in the manufacture of wax-flowers. The wax for this purpose is bleached and prepared in thin sheets of various colors, which are cut out into the shape for petals and leaves according to the kind of flower to be imitated. They are easily made to adhere, either by a slight amount of heat or a little melted wax.

WAX INSECT, *Coccus sinensis*; see *Coccus*, a very small white insect, a native of China, of the same genus with the cochineal and kermes insects, and with the scale insects, which are the pest of our greenhouses, valuable on account of the wax which it produces. It is found about the beginning of June on the branches of certain trees on the juices of which it feeds, particularly on those of a kind of sumach (*rhus succedanea*). The wax is deposited on the branches as a coating which resembles hoar-frost. This is scraped off toward the end of August, melted in boiling-water and strained through a cloth. See **WAX**. The Chinese wax insect has been introduced by the French into Algeria.—Another wax insect is found in South America, but is not yet well known, nor has its wax become an article of commerce.

WAX-MYRTLE. See **CANDLEBERRY**.

WAX-PAINTING is an art of great importance, better known, however, under the name of encaustic painting (q.v.).

WAX-PALM, *Cerroylon*—or *Iriarte*—*andicola*, a lofty palm, found in the Andes, on the eastern borders of Peru, at an elevation of 3,000 ft. and upward above the level of the sea. It grows to the height of 160 ft., and on the cicatrices of the fallen leaves, a resinous secretion is produced in great abundance, composed of about two parts of yellow resin, and one of a kind of wax, more brittle than bees' wax. This wax exudes also from the leaves, and is whitish, almost inodorous, except when heated, when it gives out a resinous odor. It is used by the inhabitants of the country in which it is produced for making candles, but is usually mixed with wax or tallow. It is probable that the wax palm would succeed well in the south of Europe, as its native climate is

not dissimilar. The usual method of obtaining the wax is by felling the tree. Each tree yields about 25 lbs. The wax is scraped off, melted, and run into calabashes. The timber of this palm is very hard and durable; the leaves are used for thatching, and the fibers for cordage. The tree is a beautiful one, with a stately stem, and a head of large pinnate leaves.—In some of the northern provinces of Brazil, wax is obtained from the *carnahuba* palm (q.v.).

WAX-SCULPTURE. The use of wax for sculpture is believed to be of very ancient origin; and not only have the tombs of southern Italy yielded many specimens of the portraits of the deceased modeled in wax, but many fine bronzes in antiquarian collections bear evident marks of having been modeled in wax by the process called *cire-perdue*. This consists in producing a model in wax, and then coating it with clay or other material in a soft state; this is allowed to harden; and the wax is then melted out by heat, and the molten metal poured in. A very fine cast of the wax-figure is thus obtained; but, of course, the wax-model of the artist is lost, after the first copy is taken; hence, such specimens are very highly prized by connoisseurs. During the 14th and 15th c., the art of modeling in wax, or ceroplastics, was much practiced, especially in Italy and in Germany, by many of the first artists, even Michael Angelo not excepted; and many of their original works in wax are still preserved. They were chiefly, however, in low relief, although very fine statuettes were also produced by men of great eminence.

WAX-TREE. *Vismia*, a genus of plants of the natural order *hypericaceae*, having a 5-parted calyx and 5 petals, generally covered with soft hairs on the inside. All the species yield a yellow viscid juice when wounded, which, when dried, becomes somewhat similar to gamboge. The species are natives of the tropical parts of America.

WAX WING, *Bombycilla*, a genus of birds of the family *amphelide*, or chattering (q.v.), having a short, straight, elevated bill, with a very wide gape, as in the fly-catchers, but without bristles; both mandibles notched at the tip; the wings rather long, broad, and pointed; the legs short; the toes long, with sharp and curved claws. The name wax-wing is derived from a very peculiar character, which the wings exhibit; some of the secondaries and tertiaries terminating in horny expansions of the shaft, resembling small pieces of red sealing-wax. The species are few, but widely diffused over the colder parts of the northern hemisphere. The only European species is the EUROPEAN WAX-WING, or BOHEMIAN CHATTERER (*B. garrula*), which is found in summer in the arctic regions of Europe, Asia, and America, migrating southward in winter, sometimes as far as the shores of the Mediterranean; most abundant in America, during winter, about the great lakes and the northern part of the valley of the Mississippi. It is found also in Japan. It is only an occasional winter-visitant of Britain. In some winters, numerous flocks are seen; in other winters, and more generally, none at all. It is in severe winters that this bird is most frequently seen in Britain, and in the more southern parts of Europe. It is gregarious in winter, and the flocks are often large. It feeds on insects and worms, seeds, berries, and other fruits. It is a handsome bird, nearly as large as the song thrush; a reddish gray, with a black patch on the throat, and a black band on the forehead; the tail-coverts brownish orange; the primaries, secondaries, and tail-feathers tipped with yellow, two white bands on the wings; the lower parts silvery gray. The head is surmounted by an erectile crest of brownish orange feathers. The song of the wax-wing is a weak whistling, bearing a little resemblance to that of the thrush. It is easily tamed. The flesh is said to be delicate food.—The AMERICAN WAXWING, or cedar bird (*B. cedrorum* or *Carolinensis*), is a very similar, but smaller species, found only in North America, from Canada to Central America, less migratory, and never visiting arctic regions. The general color is reddish olive, passing into purplish cinnamon in front, and into ash-color behind; the chin black; no white on the wings; the lower parts yellow. It is crested like the European wax-wing. Great flocks of cedar birds collect in the end of summer. They feed on berries, and are particularly fond of those of the red cedar. The cedar bird is extremely voracious, and when food abounds, sometimes gorges itself so much, that it may be taken by the hand. It is in much esteem for the table.—Another species is found in Japan, having no waxy drops on the wings.

WAXWORK, a common name for *celastrus scandens*, a climbing shrub, also called staff tree, and shrubby bittersweet. The genus comprises about eighteen species, one in the United States, the others chiefly in Asia. *Celastrus scandens*, or shrubby bittersweet, flourishes in moist soils from Canada to South Carolina, and w. of the Mississippi river, climbing upon rocks and trees to a height of 20 ft. or more; leaves alternate, ovate-oblong, pointed, finely serrate, from 2 to 5 in. in length, dark green above, lighter below; flowers dioecious, of a greenish color in terminal racemes. Calyx five parted, bell shaped; petals five, marginal toothed; stamens five on the edge of the calyx tube; ovary three-celled, styles united, stigma three lobed. Fruit globular, about the size of a large pea, opening by three valves when ripe. They are of a rich orange color, and when fully open, expose a beautiful crimson berry.

WAXY DEGENERATION is a morbid process in which the healthy tissue of various organs is transformed into a peculiar substance, allied in some respects to amyloid compounds, and in others to albuminous substances. Organs affected by this

degeneration have a certain resemblance in consistency and physical character to wax. They may be cut into portions of the most regular shape, with sharp angles and smooth surfaces; and the thinnest possible slices may be removed by a sharp knife for microscopical examination. Such organs are abnormally translucent, increased in volume, solidity, and weight. Usually, the first parts affected by this degeneration are the small blood-vessels, the middle or muscular coat being first changed. Subsequently, the secreting cells become similarly affected. When a solution of iodine is brought in contact with such tissues, a very deep violet red color is produced; and this deep red color is alone a sufficiently characteristic test. Although amyloid degeneration is common to many tissues and organs, the parts most frequently affected are the spleen, liver, and kidneys. This morbid condition in one or more organs is the expression of a general pathological state, the conditions and relations of which are as yet but little known.

WAY, in law, denotes the right of a person or persons to pass over land of another, or the path or road over which such right may be exercised. Ways are either private or public. A private right of way is derived by grant, express or implied. If one convey part of his land to another, and cannot reach the part reserved except over the part conveyed, a right of way over the latter is impliedly reserved. This is called a way of necessity. As to another method of obtaining a right of way, see *PRESCRIPTION*, *ante*. Intermediate between public and private ways are *quasi* public ways, such for instance as the inhabitants of a t. have immemorially used from their t. to a market. Such a right cannot be now created, but must be the result of an ancient custom. A highway is created where a person has expressly or presumptively dedicated a portion of his land to the public, or it may be created by statute.

WAYLAND, the Smith (Ang.-Sax. VELAND; old Norse, VÖLUNDR; Ger. WIELAND), was, according to the old German saga (the principal traits of which are already contained in the older Edda, but which is related in the most detailed form in the *Völtin-asaga*), a son of the sea-giant Wate, a nephew of king Wilkinus, and of the sea-nymph Wac-hilt. His father had bound him, at first, apprentice to the celebrated smith, Mimi, then took him across the sea to the most skillful dwarfs, from whom he not only soon learned all their science, but far surpassed them.* He afterward dwelt a long time in Ulfadalr (the wolf's valley, which, by comparison with other sagas, appears to correspond to the Greek labyrinth) along with his two brothers—Eigil, the best archer, to whom the oldest form of the Tell legend attaches; and Slagfidr, whom the saga has not further characterized. The brothers here met three swan-nymphs, and lived with them for seven years, when they flew away to follow battles as Walkyries (q.v.). Afterward, Wayland came to king Nidung, who made him lame, by cutting the sinews of his feet, and put him in prison, for which Wayland revenged himself by putting the king's two sons to death, and violating his daughter Beadohild, who afterward gave birth to Wittich, a powerful champion of the German hero-legends. Wayland then flew away in a feather-robe, which he himself manufactured, and which his brother Eigil had tried first, but was precipitated to the ground. Skillfully putting together and supplementing the various old legends, Simrock has produced the saga of Wayland, as a whole, in his poem *Wieland der Schmied* (Bonn, 1835), and in the 4th part of his *Heldenbuch* (Stuttg. 1843). The legend was a favorite one among all the Germanic nations, as is shown by the frequent allusions to it in Scandinavian, Anglo-Saxon, English, and German poems, as well as by the numerous fragments yet extant in oral tradition throughout all Teutonic countries. The German poems to which the *Völtin-asaga* appeals, which were in existence up to the 13th c., have been utterly lost. Even beyond the bounds of Germany, old French poems and traditions tell of Gallans the Smith. See Depping and Michel, *Veland le Forgeron* (Par. 1833). The legend of Wayland is in fact one of those myths common to the Indo-Germanic family. Besides the German tradition, it is found most distinctly among the Greeks, in the different stories of Dædalus, Hephaestus, Erichthonius, etc. Next to Jacob Grimm's profound discussion in the *German Mythology*, Kuhn has pointed out in the best manner the signification and ramifications of the myth in his treatise, *Die Sprachvergleichung und die Urgeschichte der Germ. Völker*, in the *Zeitschrift für vergleichende Sprachforschung* (vol. iv., Berl. 1854).

WAYLAND, FRANCIS, D.D., LL.D., 1796-1865, b. New York, of English parentage; graduated at Union college, 1813; studied medicine and commenced the practice of it at Troy, but having joined the Baptist church in 1816 and devoted himself to the ministry, studied theology at Andover seminary; was tutor in Union college, 1817-21; pastor of First Baptist church, Boston, 1821-26; pres. of Brown university, 1827-55; after which was pastor of First Baptist church, Providence. He was celebrated as an instructor, preacher, and writer—a man of great wisdom and self-devotion. Among his published works are, *Elements of Moral Science*; *Elements of Political Economy*; *Elements of Intellectual Philosophy*; *Christianity and Slavery*; *Limitations of Human Reason*; *Life of Adoniram Judson, D.D.*; *Thoughts on the Collegiate System of the United States*. This last led in 1849 to the adoption of the voluntary system at Brown university. His life has been written by his sons.

* The name Wayland is from a root signifying art, cunning; from which come Eng. *wile* and (through old Fr.) *guile*. Ang.-Sax. *velan* means to fabricate.

WAYMOUTH, GEORGE, b. England, 1570; accompanied sir Fernando Gorges on an expedition along the Atlantic coast of North America, sailed up the Penobscot and Kennebec rivers, and persuaded some of the natives to return with him to England. In 1605, there was published, *A True Relation of the most Prosperous Voyage made this present year, 1605, in the Discovery of the Land of Virginia, and 60 miles up a most Excellent river, by Capt. George Waymouth, written by James Rosier, a Gentleman employed in the Voyage.*

WAYNE, a co. in s.e. Georgia, bounded on the n.e. by the Altamaha river, drained by the Satilla; 550 sq.m.; pop. '80, 5,980—5,954 of American birth; 1,920 colored. Co. seat, Waynesville.

WAYNE, a co. in s. Illinois, drained by the Little Wabash river, the Skillet fork, and Elm creek; 720 sq.m.; pop. '80, 21,297—20,979 of American birth, 14 colored. Co. seat, Fairfield.

WAYNE, a co. in e. Indiana, intersected by numerous railroads; 400 sq.m.; pop. '80, 38,614—35,736 of American birth, 1,711 colored. Co. seat, Richmond.

WAYNE, a co. in s. Iowa, drained by the Chariton river, forming its n.e. border, the South Fork, and two branches of Locust creek; 520 sq.m.; pop. '80, 16,127—15,674 of American birth, 21 colored. Co. seat, Corydon.

WAYNE, a co. in s. Kentucky, drained by the Cumberland river and its branches, 630 sq.m.; pop. '80, 12,512—12,487 of American birth, 89 colored. Co. seat, Monticello.

WAYNE, a co. in s.e. Michigan, drained by the Huron, Rouge, and Detroit rivers, the latter, with lake St. Clair, forming its e. boundary, having lake Erie on the s.e.; 600 sq.m.; pop. '80, 166,426—106,375 of American birth, 3,406 colored. Co. seat, Detroit.

WAYNE, a co. in s.e. Mississippi, 760 sq.m.; pop. '80, 8,741—8,719 of American birth, 3,771 colored. Co. seat, Waynesborough.

WAYNE, a co. in s.e. Missouri, drained by the Big Black, Castor, and St. Francis rivers; 660 sq.m.; pop. '80, 9,097—8,925 of American birth, 107 colored. Co. seat, Greenville.

WAYNE, a co. in n.e. Nebraska, drained by affluents of the Elkhorn river; 450 sq.m.; pop. '80, 813—650 of American birth, 1 colored. Co. seat, La Porte.

WAYNE, a co. in w. New York, having lake Ontario for its n. boundary, 600 sq.m.; pop. '80, 51,701—43,818 of American birth, 402 colored. Co. seat, Lyons.

WAYNE, a co. in central North Carolina, intersected by the Neuse river; 500 sq.m.; pop. '80, 24,943—24,850 of American birth, 12,133 colored. Co. seat, Goldsborough.

WAYNE, a co. in central Ohio; 550 sq.m.; pop. '80, 37,452—34,661 of American birth, 167 colored. Co. seat, Wooster.

WAYNE, a co. in n.e. Pennsylvania, having the Delaware river for its n.e. and e. boundary; 760 sq.m.; pop. '80, 33,512—28,290 of American birth, 32 colored. Co. seat, Honesdale.

WAYNE, a co. in central Tennessee; 800 sq.m.; pop. '80, 11,301—11,282 of American birth, 1,064 colored. Co. seat, Waynesborough.

WAYNE, a co. in s.w. West Virginia, having the Ohio river for its n. boundary; 330 sq.m.; pop. '80, 14,737—14,698 of American birth, 219 colored. Co. seat, Wayne Court House.

WAYNE, ANTHONY, an American general of the war of the Revolution, was born at Waynesborough, Penn., Jan. 1, 1745. His grandfather, a native of Yorkshire, commanded a squadron of dragoons at the battle of the Boyne, and emigrated to Pennsylvania. Anthony was educated at Philadelphia; at the age of 18, he was employed as a land-surveyor, and was selected by Benjamin Franklin to form a projected settlement in Nova Scotia. At the beginning of the American revolution (1775), he was married and settled on a farm in Pennsylvania, taking an active interest in politics, and became a member of a committee of safety, and studied military drill and tactics. At the outbreak of hostilities, he raised a regiment of volunteers, of which he was appointed colonel, and sent to Canada; where he covered the retreat of the provincial forces at Three Rivers. He commanded at Ticonderoga until 1777, when he was made brig.gen., and joined Washington in New Jersey; commanded the rear-guard in the retreat at Brandywine; led the attack at Germantown; captured supplies for the distressed army at Valley Forge; distinguished himself at Monmouth; was defeated at Paoli; but achieved the most brilliant victory of the war in the storming of Stony Point (q.v.), July 15, 1779. His courage and skill saved Lafayette in Virginia, 1780; and he aided in the siege of Yorktown, and commanded in Georgia. At the close of the war, rewarded by popular enthusiasm, and having, by his dash and audacity, acquired the sobriquet of "Mad Anthony," he retired to his farm at Waynesborough, and engaged in promoting the construction of roads and canals. In 1792, he commanded a successful expedition

against the Indians of the north-western territories; where he remained, until 1796, as U. S. commissioner. He died at the garrison at Presque Isle (now Erie), Dec. 14, 1796.

WAYS AND MEANS, COMMITTEE OF, a committee of the house of commons appointed to determine the modes of raising the money which the house—after resolutions reported from the committee of supply, and agreed to—has granted to the crown. Like the committee of supply, it is always a committee of the whole house. A chairman, elected by the committee of supply, but known as the chairman of the committee of ways and means, presides over both committees. One of the most important occasions for which the committee sits is to receive the budget, or annual financial statement of the year from the chancellor of the exchequer. The propositions of the government regarding loans, duties, taxes, tolls, and any other means for raising revenue, are submitted to the consideration of the committee of ways and means in the shape of resolutions. The amount proposed to be raised must not exceed the sum granted in the committee of supply; and the chancellor of the exchequer is bound to satisfy the house, by a detail of the sums granted for the several services, that the amount of these sums will be a sufficient justification, in point of quantity, to the committee of ways and means to adopt such measures and impose such taxes as shall then be recommended. Such resolutions as are agreed to are adopted and embodied in bills, and in due time become law. See **SUPPLY, COMMITTEE OF; PARLIAMENT.**

WAYWODE, a word of Slavonian derivation, meaning "war leader," applied to military commanders in Poland, where each province, or *arricre ban*, had its waywode, or voyevoda, in Russia, until abolished by Peter the great; and in Moldavia and Wallachia, where it was supplanted by the Greek *despota*, and finally by its Slavonian equivalent, *hospodar*.

WEAK FISH, the *cyanoecion regalis*, a common fish of the family scænidæ, abounding along the Atlantic coast of the United States. It has a pale, brownish color above, with a greenish tinge, grading into silvery along the sides and belly, and a variegated mottling with brown venicular blotches. It is from 1 to 2 ft. long and is purely a salt-water fish; and from its shape and habit of taking the hook is in some places called salt-water trout.

WEAKLEY, a co. in w. Tennessee, drained by branches of the Obion river; 600 sq.m.; pop. '80, 24,538—24,493 of American birth, 4,412 colored. Co. seat, Dresden.

WEALDEN FORMATION, a series of fresh-water strata belonging to the lower cretaceous epoch. Having been originally studied in the parts of Kent, Surrey, and Sussex called the Weald, this local name was given to the formation. It has been divided into two series, which do not differ very materially from each other, viz., Weald clay, 560 ft.; Hastings sand, 740; total 1300. The Weald clay consists of blue and brown clay and shale with thin beds of sandstone and shelly limestone. These strata were probably lake or estuary deposits, and contain the remains of the land flora and fauna, often in great abundance. The beds of limestone called Sussex marble, are almost entirely composed of a species of *pulchra*, not very different from the common *P. vivipara* of English rivers. The clays are often laminated by thin layers, consisting of immense numbers of the shells of minute *cyprides*. But the most remarkable animal remains are those of the huge reptiles which lived on the land, tenanted the air, or abounded in the sea, such as the iguanodon (q.v.), hylæosaurus (q.v.), pterodactyl (q.v.), and the numerous species of turtles which have been described from these strata. The vegetable fossils belong chiefly to ferns, and to the gymnospermatus orders of conifers and cycads; the fruits of several species of both orders have been found; and in some places the rolled trunks of *endogenites* and *clathraria*, belonging to cycads, and of different species of coniferous wood, occur in enormous quantities, as at Brook Point, in the Isle of Wight, where the shore at low water is strewn with them.

The Hastings beds contain more sandstone and less clay than those of the upper Weald clays. The picturesque scenery of the High Rocks and other places in the neighborhood of Tunbridge, is weathered out of the beds of white sandstone belonging to this period. The remains of the huge Wealden reptiles abound in the sandstones of this division. The Tilgate forest-beds, where Dr. Mantell first found the iguanodon, and the rocks in the neighborhood of Hastings, are the best-known repositories of those remarkable fossils.

The deposition of the Wealden beds was followed by a gradual depression of the land when these fresh-water deposits were covered by the estuary beds of the newer *greensand*. The depression continued until the fresh-water and estuary strata formed the bottom of a deep sea, on which were deposited the immense beds of chalk and allied strata which form the bulk of the cretaceous series. In the process of elevation, these beds have suffered denudation, so that districts which were covered with cretaceous beds have been cleared of them, and immense valleys have been furrowed through the chalk, greensand, and Wealden.

WEALTH. See **CAPITAL.**

WEANING AND FEEDING IN INFANCY. The propriety of mothers nursing their own children is now so universally acknowledged, that it is the duty of the physician

less frequently to urge maternal nursing than to indicate those cases in which it becomes necessary to substitute another mode of rearing the infant. "Women," says Dr. Maunsell, "who labor under any mortal or weakening disease—as phthisis, hemorrhages, epilepsy—are obviously disqualified from the office of nurse. Some who are in other respects healthy, have breasts incapable of secreting a sufficient supply of milk. In other instances, the breast may perform its functions well, but the nipple may be naturally so small, or may be so completely obliterated by the pressure of tight stays, as not to admit of its being laid hold of by the child. These are actual physical hindrances to nursing. Again, women may, and, in the higher classes, frequently do, possess such extremely sensitive and excitable temperaments, as will render it imprudent for them to suckle their own children. Frightened and excited by every accidental change in the infant's countenance, and inordinately moved by the common agitations of life, such persons are kept in a state of continual fever, which materially interferes with the formation of milk both as to quantity and quality. Women, also, who become mothers for the first time at a late period of life, have seldom the flexibility of disposition or the physical aptitude for the secretion of milk, required to constitute a good nurse."—*A Treatise on the Management and Diseases of Children*, 4th ed., 1842, pp. 39, 40. In ordinary cases, the child should be put to the breast as soon as the latter begins to contain anything; and when the secretion of milk has fairly commenced, it will require no other food until the seventh or eighth month, provided the mother be a good nurse. During the first five or six months, the infant should be put to the breast at regular intervals of about four hours; afterward, when the teeth are beginning to appear, the child need not suck more than four times in the twenty-four hours, some artificial food being given to it twice during the same period. This at first may consist of soft bread steeped in hot water, with the addition of sugar and cow's milk; and subsequently a little broth, free from salt and vegetables, may be given once a day. The spoon is now the best medium of feeding, as the food should be more solid than could be drawn through the sucking bottle. The time of weaning should be that indicated by nature, when, by providing the child with teeth, she furnishes it with the means of obtaining its nourishment from substances more solid than milk. If the infant has been gradually accustomed to a diminished supply of maternal and an increase of artificial food, weaning will be a comparatively easy process; and much of that suffering both to parent and child will be spared, which commonly ensues when a sudden change is made. In ordinary cases, the period of weaning varies from the seventh to the twelve month; sometimes the child is kept to the breast for a much longer period, from the popular idea that lactation prevents pregnancy, but such unnaturally prolonged lactation is usually injurious to both mother and child.

In those cases in which it is inexpedient or impossible for a mother to suckle her own child, the choice of a wet-nurse becomes a subject of much importance. Upon this subject, Dr. Maunsell lays down the following important practical rules: "The great thing we have to look to is to ascertain that both the woman and her child are in good health; and of this we must endeavor to judge by the following signs: The woman's general appearance and form should be observed, and they ought to be such as betoken a sound constitution. Her skin should be free from eruptions; her tongue clean, and indicating a healthy digestion; her gums and teeth sound and perfect; the breasts should be firm and well formed—not too large or flabby—and with perfect, well developed nipples. We should see that the milk flows freely, upon slight pressure; and we should allow a little of it to remain in a glass in order that we may judge of its quality. It should be thin, and of a bluish-white color; sweet to the taste; and when allowed to stand, should throw up a considerable quantity of cream. A nurse should not be old, but it is better that she should have had one or two children before, as she will then be likely to have more milk, and may be supposed to have acquired experience in the management of infants. Having examined the mother, we must next turn to the child, which should be well nourished, clean, and free from eruptions, especially on the head and buttocks. We should also carefully examine its mouth, to ascertain that it is free from sores or aphthæ. If both woman and child bear such an examination, we may with tolerable security pronounce the former to be likely to prove a good nurse."—*Op. cit.* pp. 44, 45. In one respect, we differ from this eminent physician. He holds that "the more recently the nurse's own confinement has taken place, provided she has recovered from its effects, the better." Supposing a nurse is required for a new-born infant, this rule holds good; but provided a nurse is required for an infant of three or four months old (for example), it is preferable to obtain a nurse whose milk is of that age. We believe it to be a general physiological law that the age of the milk should correspond to the age of the infant; that is to say, that an infant taken at any given age from its mother, before the normal period of weaning, should be provided with a nurse who was confined about the same time as its own mother.

A wet-nurse should be very much preferred to any kind of *artificial feeding*; but peculiar cases may occur in which it is impossible to procure a nurse; or an infant whose mother is incapable of nourishing it may be the subject of a disease that may be transmitted through the infant to the nurse. In these cases, a food must be provided as nearly as possible resembling the natural food; and this is naturally sought for among the food of animals. The milk of the cow is most commonly used, in consequence of its being

the most easily obtained; but ass's milk more nearly resembles human milk, as is shown from the following comparative analyses by professor Playfair:

	Woman.	Cow.	Ass.
Caseine.....	1.5	4.0	1.9
Butter.....	4.4	4.6	1.3
Sugar.....	5.7	3.8	6.3
Ashes.....	0.5	0.6	...
Water.....	88.0	89.0	90.5

The most important difference between cow's milk and woman's milk is the great excess of caseine in the former. The former fluid may, however, be made to resemble the latter in composition in either of the following ways: (1) On gently heating cow's milk, a membrane of caseine forms on the surface; by removing two or three of these membranes as they form, we can reduce the quantity of caseine to the desired extent; or (2) we may dilute cow's milk with twice its bulk of pure water, and add a little sugar. This food should be administered at a natural temperature (of about 98°) through a sucking-bottle; and as the child grows older, it will soon be able to take natural cow's milk without inconvenience. The nature and importance of the mixture of milk and farinaceous food known as Liebig's soup for children, are described under *Soup*.

The rules regarding the times, etc., of feeding are similar to those laid down for suckling. Assuming that the infant, whether brought up at the breast or artificially reared, has been safely weaned, we have to consider what rules should be laid down regarding its food subsequently. For some months after weaning, the food should consist principally of semi-fluid substances, such as milk thickened with baked flour, or pap, to which a little sugar should be added. Light broths may also be administered, especially in the occasional cases in which milk seems to disagree; and bread and butter may be tried in small quantity. We shall conclude this article with the following "model of a suitable diet for children," which cannot be too strongly impressed upon the minds of all young mothers: "A healthy child, of 2 or 3 years old, commonly awakes hungry and thirsty at five or six o'clock in the morning, sometimes even earlier. Immediately after awaking, a little bread and sweet milk should be given to it, or (when the child is too young to eat bread) a little bread-pap. The latter should be warm; but in the former case, the bread may be eaten from the hand, and the milk allowed to be drunk cold, as it is well at this meal to furnish no inducement for eating beyond that of hunger. After eating, the child will generally sleep again for an hour or two; and about nine o'clock it should get its second meal, of bread softened in hot water, which latter is to be drained off, and fresh milk and a little sugar added to the bread. Between one and two, the child may have dinner, consisting, at the younger ages, of beef, mutton, or chicken broth (deprived of all fat), and bread. When a sufficient number of teeth are developed to admit of chewing being performed, a little animal food, as chicken, roast, or boiled mutton, or beef, not too much dressed, should be allowed, with a potato or bread, and some fresh, well-dressed vegetable, as turnips or cauliflower. After dinner, some drink will be requisite; and a healthy child requires, and indeed wishes for nothing but water. Light, fresh table-beer would not be injurious to a child of 4 or 5 years old, but it is unnecessary. Between six and seven o'clock, the child may have its last meal of bread steeped in water, etc., as at nine o'clock in the morning. A healthy child which has been in the open air during the greater part of the day, will be ready for bed shortly after this last supply, and will require nothing more till next morning. Similar regimen and hours may be adopted throughout the whole period of childhood; only as the fourth or fifth year approaches, giving, for breakfast and supper, bread and milk without water, and either warm or cold, according to the weather or the child's inclination. The supply of food upon first awaking in the morning may also be gradually discontinued, and breakfast be given somewhat earlier.—*Op. cit.* pp. 80, 81.

WEARE, MESHECH, 1713-86; b. N. H.; graduated at Harvard, 1735, studied law and carried on a successful practice. He was a member and speaker of the colonial legislature, commissioner at the Albany colonial congress, 1754; chief justice of the N. H. supreme court in 1777; and president of the state from 1776 until the end of the war, and again in 1874. He displayed great vigor during the revolution in raising and equipping troops.

WEASEL, *Mustela*, a genus of quadrupeds of the family *mustelidæ* (q. v.), having a very elongated body; short feet, with toes quite separate, and sharp claws; four molar teeth on each side above, and five below. The COMMON WEASEL (*M. vulgaris*) is a native of almost all the temperate and cold parts of the northern hemisphere, except the most arctic regions. Its range does not extend quite so far n. as that of the ermine. It is the smallest of the *mustelidæ* of the old world, not exceeding 2½ in. in height, and 7½ in. in length, from nose to tail; the tail about 2½ in. long, and terminating in a point, not so bushy as that of the stoat or ermine. The female is smaller than the male. The head is large; the ears short, broad, and rounded, the whiskers long. The color is reddish-brown on the upper parts, sides, legs, and tail; the throat and belly white. The eyes are small, round, and black, with a very keen expression, to which the whole habits of the animal correspond. It is nimble and active, bold, and yet wary. It may often be seen peeping curiously from a hole in a wall,

but vainly does the school-boy attempt to strike it with a stone. Catching it is out of the question for him, and so far well, for it is ready to bite severely. It is a most persevering hunter, its scent as keen as its sight, quarters the ground like a dog, and wears out animals larger and apparently much stronger than itself. It preys on mice, rats, voles, small birds, and other small animals, sometimes even on hares and rabbits, robs birds' nests, devouring the young birds or sucking the eggs, and is occasionally troublesome in poultry-yards, killing young chickens. It climbs walls and trees with great agility, and does not hesitate to plunge into water in pursuit of the water-rat. It sometimes begins by abstracting the blood of the animal which it has killed, and generally devours the brain; but when food is abundant, it carries the body to its retreat, where a considerable quantity of prey is often found, the weasel preferring to eat it in a half-putrefied state. The weasel generally sleeps during the day, and is most active at night. It has a disagreeable smell, which is strongest in hot weather, or when it has been pursued or irritated. It is capable of being tamed when taken young, and becomes docile and gentle. The female weasel makes a nest of straw-leaves and moss for her young which are produced in spring, four or five in a litter; often in a crevice of a bank, or in a hollow tree. The fur of the weasel is an article of commerce in some northern countries, and weasel-skins are exported in considerable quantity from Siberia to China. The weasel sometimes, but rarely, becomes white in winter, like the ermine.—The ermine (q.v.), or stoat, is another species of weasel.—America has several species of weasel, of which one (*M. pusilla*) is rather smaller than the common weasel of Europe, and has a shorter tail. It is abundant in the northern parts of the United States, and its range extends far to the north. In the United States, it remains brown all winter; but in the fur-countries it becomes white.

WEATHER is the condition of the atmosphere at any time in respect of heat, moisture, wind, rain, cloud, and electricity; and a change of weather implies a change in one or more of these elements. From the direct bearing weather-changes have on human interests, they have from the earliest times been closely watched, so that the causes by which they are brought about may be discovered, and their approach predicted with some confidence. The craving in the public mind for this knowledge is strongly attested by the weather prognostics of every language, which, with much that is shrewd and of considerable value, embrace more that is vague, and not a little positively absurd.

It is not necessary here to refer to Moore, Zadkiel, and other almanac-makers of that class, except as proving by their mere existence a wide-spread ignorance of even the most palpable elements of physical law. Prognosticators of higher pretensions repeatedly appear before the public, and it is curious to note how their predictions are laid hold of by the newspapers, and scattered broadcast over the country. Among this class was Mathieu de la Drome, whose predictions of storms and rains made so much noise, that the emperor Napoleon requested the celebrated Leverrier to examine the grounds on which his predictions were founded. The exposure was complete. One of his principal predictions was based entirely on a high average of the rain-fall at a particular season. On examining the rain-fall of the particular years from which the average had been taken, it was found that the excess was entirely due to an unprecedentedly heavy rain which occurred in one of the years at that season. One of the most remarkable predictions of recent times was made by an Irish nobleman in reference to Sept., 1865, which turned out to be in accordance with the prediction—dry, warm, and fine, beyond precedent for that month. The celebrity of this prediction has, however, been greatly reduced by other predictions made since, which the event did not verify.

The changes of the moon were long, and in many minds still are, regarded as supplying the elements of prediction. In order to test the real value of the moon's changes on the weather, the Greenwich observations of 50 years were carefully examined, and it was found that the number of instances in which the weather was in accordance with the prognostication was one instance less than those in which the weather was different. When brought to the test of accurate examination and figures, the theory of the moon's changes on the coming weather is by this, as well as by similar investigations of old records of the weather, proved to be a delusion; but since most people have a bias toward forgetting the unsuccessful and remembering the successful prognostications, the theory may continue to be accepted, until a sounder knowledge of the natural laws are more generally diffused.

For some years Mr. Thomas du Boulay predicted the general character of the weather of each summer from the weather-conditions which prevailed during the week of the spring equinox preceding, supposing that the general character of the weather of the next six months is already settled, and that it only requires the necessary skill to read its features, since these will remain generally constant till autumn. For a few years he speculated in grain on the faith of the predictions, which turned out pretty correct. Latterly, however, his predictions were not verified.

The truth is, that no prediction of the weather can be made, in the British islands at least, for more than about two days beforehand. Any attempt at a longer prediction is illusory. We would here refer to the article STORMS, as showing the possibility and mode of making real predictions of the weather. Almost all the weather-changes of Europe begin from

westward, and pass over Great Britain, following a generally easterly course. Unsettled or bad weather is accompanied with a low barometer; elsewhere, the barometer is higher. Suppose that from weather-telegrams received, it is seen that everywhere in Europe barometers are high, no storm is imminent and generally none is likely to happen for about two days at least. But if, on the following morning, barometers begin to fall a little in the west of Ireland, and an easterly wind begins to blow over Great Britain and Norway, and a s.e. wind over France; then, seeing the winds blow toward the lowest barometer, or rather a little toward the right of it, the presumption is that a storm of greater or less severity is coming up, the center of which is likely to pass over England. This ought, therefore, to be closely watched; and if the winds keep in nearly the same direction, or veering slowly toward the s. and w., increase in force, and barometers in the west of Ireland fall rapidly, a great storm is portended, of the approach of which warning should be at once issued. But if, on the contrary, the winds do not increase in force, and the barometer fall only slightly, or cease to fall, the storm has either passed considerably to the n. of the British islands, or its approach will be delayed for some time; and hence no immediate warning may be necessary.

It is our proximity to the Atlantic that makes it impossible to predict the weather beyond two days at the utmost. In Norway and the Baltic, and places toward the east of Europe, the weather may be predicted for a longer time owing to the more easterly situation of these places. In America also, where storms advance chiefly from w. to e., gales and unsettled weather are predicted to places on the sea-board in the east some days before.

The collecting of this information by the telegraph is a work which, owing to the expense, governments only can accomplish; and from its public importance, it is an incumbent duty which they should discharge for the benefit of the sea-faring and agricultural population. A good deal may, however, be done by each one for himself, by observing his barometer, the winds, and the face of the sky—especially the cirrus cloud—the most elevated and delicate of the clouds. But ere these simple observations can be turned to account, and made the basis of an intelligent prediction, some knowledge of the general features of storms (q.v.) is indispensable. These specially—(1) Storms have a circular area; and (2) advance in an easterly direction, bearing a low barometric pressure with them. (3) Winds blow from a high to a low barometer, the observer, standing with his back to the wind, having always the low barometer to his left in the northern hemisphere, and (4) with a force proportioned to the difference of the pressure, or to the steepness of the barometric gradient. (5) Storms are first noticed in the upper regions of the atmosphere, or in the region of the cirrus cloud. (6) In front of the storm the air is warm and humid; in the rear of it, cold, or cool and dry. With such observations, requiring only a barometer intelligently interpreted, particularly if hills form part of the landscape, the character of the weather may be foreseen for one day, or even on occasions longer.

To the agriculturist and horticulturist, not high winds but hails, heavy rains, frosts and fine weather are what are required to be known. Such forecasts have been issued for some time by gen. Myer in the United States, were also begun in France by Leverrier shortly before his lamented death, and are gradually being introduced over the continent of Europe, with great advantage to those national interests. But though no prediction of the weather for weeks or months beforehand can be made with any pretensions to trustworthiness, yet guesses or surmises may be formed not without some value. All observation goes to prove that predictions based on solar or other astronomical causes are without foundation, and that averages based on terrestrial observations are the only guides in the matter. Of this class are the interruptions which occur in the regular march of temperature in the course of the year. Thus, cold weather generally prevails from the 11th to the 14th of April—that is, the period of the “borrowing days” (O.S.), and in the second week of May; and these, with some other cold and warm periods,* are almost co-extensive with the northern hemisphere of the globe. Hence, then, at these times, when the weather becomes cold or warm, it may be predicted that such weather will last for several days. Again, if, after a long-continued prevalence of s.w. winds, the n.e. wind should set in, it is highly probable that easterly winds will prevail for some time; so that, if the season be winter, a continuance of frost, and perhaps snow, may be looked for; but if midsummer, the weather will become dry, warm, and bracing. But suppose easterly winds have been unusually predominant in autumn, and

* I have examined the temperature of Scotland for a number of years and have shown (*Jour. of Scot. Meteorolog. Soc.*, Nos. xiii., xiv., xvi.) that the following interruptions occur from year to year, with very rare exceptions, in the annual march of the Scottish temperature:

Six cold periods.....	1. 7th to 10th February.
	2. 11th to 14th April.
	3. 9th to 14th May.
	4. 29th June to 4th July.
	5. 6th to 11th August.
	6. 6th to 12th November.
Three warm periods.....	1. 12th to 15th July.
	2. 12th to 15th August.
	3. 2d to 9th December.

south-westerly winds begin to prevail in the end of November or the beginning of December, it is most probable that the weather will continue exceptionally mild, with frequent heavy storms of wind and rain till about Christmas.

A good beginning has been made in India by Mr. BLanford in predicting the character of the monsoon season, it having been shown by him that abnormal distributions of atmospheric pressure which happen to prevail about its commencement, tend to perpetuate themselves during the season. Since the distribution of the rains depends on the distribution of atmospheric pressure, forecasts of the coming monsoon have been issued, which thus proceed from a scientific basis, and the event has shown them to have been remarkably successful. It may be predicted that as systematic observation advances, the power to predict the character of the coming season will be extended to higher latitudes. See METEOROLOGY.

WEATHERING, a slight inclination given to the top of a cornice or molding, to prevent water from lodging on it.

WEAVER-BIRD, *Ploceus*, a genus of bird of the finch family (*fringillidae*), of a group or sub-family (*ploceinae*), to most of which the name weaver-bird is extended. The name has reference to the remarkable structure of the nests of these birds, which are woven in a very wonderful manner of various vegetable substances, and are objects of great interest. The *ploceinae* are natives of the warmer parts of Asia, of Africa, and of Australia; none being found in Europe nor in America. The species are numerous. They are small birds, with a strong conical bill, the ridge of which is slightly curved, the tip entire. The claws are large and very long. The wings are pointed, the first quill remarkably short. There is great diversity in the form and appearance of the nests constructed by different species. One of the best-known species is the PHILIPPINE WEAVER (*P. Philippinus*), the baya (q.v.) of India. Many of the other weaver-birds construct nests pretty much on the same plan with this—pouches elongated into tubes, entering from below; those of some are kidney-shaped, and the entrance is in the side. They very generally suspend their nests in the same way from the extremities of branches, and often prefer branches which hang over water, probably as affording further security against monkeys, squirrels, snakes, and other enemies. Social habits are very prevalent among them, and many nests of the same species are often found close together. Some of them attach the nest of one year to that of the year preceding, as the *ploceus pensilis* of Madagascar, which sometimes thus makes five nests in succession, one hanging to another. Some of the African species build their nests in company, the whole forming one structure. Thus, the SOCIAL or REPUBLICAN weaver-bird of south Africa (*ploceus socius* or *philotarus lepidus*) constructs a kind of umbrella-like roof, under which 800 or 1000 nests have been found, the nests like the cells of a honeycomb, and arranged with wonderful regularity. An acacia with straight, smooth stem, such as predaceous animals cannot easily climb, is often selected by the bird-community. When the situation is chosen, the birds begin by constructing the roof, which is made of coarse grass, each pair afterward build their own nest, which is attached to the roof. As new nests are built every year, the weight of the structure often becomes so great as to break down its support. *Tertor erythrorhynchus* is a bird of the weaver group, which is commonly seen in south Africa accompanying herds of buffaloes, and feeding on the bots and other insects which infest them, alighting on their backs to pick them out of the hide. The bird is often of great use to the buffalo in another way, by giving warning of the approach of an enemy. The whydaw birds (q.v.) or widow birds, likewise belong to the group of *ploceinae*.

WEAVING, the art by which threads or yarns of any substance are interlaced so as to form a continuous web. It is perhaps the most ancient of the manufacturing arts, for clothing was always a first necessity of mankind. The methods by which weaving is now accomplished have been explained under loom (q.v.); it therefore only remains to describe the variations which may be effected by ingenious applications of the powers of the loom; and as these are almost endless, some of the more common and easily understood will be chosen. The simplest form of weaving is that employed in making the mats of uncivilized nations. These consist of single untwisted fibers, usually vegetable, arranged side by side to the width required, and of the length of the fibers themselves, which are tied at each end to a stick, which is so fixed as to keep the fiber straight, and on the same plane. Then the weaver lifts up every other of these longitudinal threads, and passes under it a transverse one, which he first attaches by tying or twisting to the outermost fiber of the side he commences with, and afterward in the same way to that on the other side, when it has passed through the whole series. The acquisition of the art of spinning threads of any length enables more advanced nations to give great length to the warp, or series of threads which are first arranged, and to pass the weft or transverse thread backward and forward by means of a shuttle, without the necessity of fixing at the sides. The mechanical appliances already described under LOOM aid these operations to an amazing extent. That kind of weaving which consists of passing the weft alternately over and under each thread of the warp is called *plain* weaving; but if the weaver takes up first one and then two threads alternately of the warp series, and passes the weft under them for the first shoot of his shuttle, and raises those which were left down before for the second shoot, he produces a cloth with a very different

appearance, called twill (q.v.), many varieties of which may be produced by varying the numbers missed or taken up—as, for example, one and three, instead of one and two.

There are few arts which require more patience or skill than weaving. As many as from one to two thousand threads often constitute the warp; and these threads may be so varied in quality (see YARN) as to produce many varieties of fabric. From that cause alone there are almost infinite variations. Many may be produced by the order in which the threads are lifted for the passage of the weft—that of itself can also vary as much or more in its quality and other circumstances, so that the inventive genius of the weaver finds incessant opportunities for its display, and nice arithmetical calculations are required in estimating and allotting the numerous threads to the endless variety of patterns which are constantly passing through the looms. A really practical knowledge of weaving can only be obtained by working with looms, and studying such technical treatises as Watson's *Theory and Practice of the Art of Weaving*, and some of the elaborate treatises by the French weavers.

There is no branch of manufacture in which inventions and improvements are more rapidly succeeding each other than in weaving; but, as a rule, they are of minor importance, and rarely affect the general principles of the process. In 1867, however, the novelty of *convex* weaving by machinery was introduced, and although only at present applied to ladies' stays, seems to promise a wide application to clothing generally, and many other purposes.

Out of the numerous attempts that have been made during the last ten years to weave by machinery a convex surface, such as is required in several articles of clothing, hardly one, up to the present time, has succeeded. This failure has been owing partly to deficiencies in the various inventions of this kind, and partly to the costliness of carrying them out. At last, after long and patient trials, a patent convex weaving-loom has been invented that not only answers all the purposes of the hand loom, hitherto exclusively used, but also possesses the advantage, which is absolutely necessary in a country where labor is scarce, of doing ten times the amount of work in the same space of time. With the hand-loom, one man can make, at the very utmost, only four pair of stays in a day, whereas the new-invented convex weaving machine turns out 40 pair daily. The superior lightness and flexibility of woven stays, and their perfect freedom from hard seams, have increased to a very large extent the demand for this class of goods. Up to the present moment, hand-labor alone has been employed in France and Würtemberg, two countries where they have been most extensively manufactured. In the United States, however, where the high wages for hand-labor have necessitated the most extensive use of machinery, this system could not be adopted with any possibility of pecuniary success; and, in consequence of this fact, a loom for weaving of stays and other convex goods had to be invented. This loom, which was constructed under the superintendence of M. Oppé, for the convex weaving company in New York, does the work automatically and to perfection.

The principle of a constant length of travel for the shuttle was adopted for the sake of simplicity; but, as it is necessary, in weaving the gores, that the weft-thread should pass through only a part of the breadth of the warp, the Jacquard has been employed for the purpose of taking up the portion of the warp required to be woven in that part. It is impossible by mere verbal description to give any adequate notion of this ingenious machine without seeing it in operation.

Bonelli's loom is an ingenious attempt to substitute for the costly perforated cards of a Jacquard loom an endless band of paper covered with tinfoil, on which the required pattern is traced with a varnish, rendering the parts thus covered non-conducting. This band of paper passes under a series of thin metallic teeth, each connected with a small electro-magnet, and these magnets act on a series of small pistons. According as these teeth come in contact with the metallic surface or the varnish, so is a series of holes in a perforated plate closed or opened when an electric current is passing. The perforations in the plate correspond to the punched holes in the cards of a Jacquard, and act in the same way upon its needles. See JACQUARD LOOM. Bonelli's loom, though it was perfect enough for practical work in 1860, has not yet been brought into use. It is fully described in the *Society of Arts' Journal*, Jan. 6, 1860.

WEBB, a co. in s. Texas, having the Rio Grande for its w. boundary, separating it from Mexico; 1200 sq.m.; pop. '80, 5,273—2,502 of American birth, 182 colored. Co. seat, Laredo.

WEBB, ALEXANDER S., b. N. Y., 1835; educated at West Point, and appointed to the artillery. He was stationed in Florida and on the frontier, and was for 4 years assistant professor of mathematics at West Point. At the beginning of the war of the rebellion he aided in the defense of fort Pickens. He was at the first battle of Bull Run, was attached to the army of the Potomac in the peninsula campaign of 1862, and was appointed brig. gen. of volunteers in 1863. At Gettysburg he led a brigade, where he was wounded. In 1864 he commanded a brigade in the battles of the Wilderness, and was dangerously wounded. Returning to the service early in 1865, he was Meade's chief of staff till the close of the war. Since 1871 he has been president of the college of the city of New York.

WEBB, CHARLES HENRY, b. N. Y., 1835. When a young man he visited California, and was the founder and editor of *The Californian*. He has since written sketches and humorous articles under the pseudonym of "John Paul." He has also written several burlesque dramas, and is the inventor of an "adding machine."

WEBB, GEORGE JAMES, b. Mass., 1805; an eminent composer and teacher of music; professor for several years in the Boston academy of music. He has published *American Glee Book; Common School Songster; The Vocal Class Book for Schools; Massachusetts Collection of Psalmody; Orthophony; Cantica Ecclesiastica*; and with William Mason (whose wife was his daughter) some musical publications.

WEBB, JAMES WATSON, b. Claverack, N. Y., 1802; entered the U. S. army in 1819 as 2d lieut. of artillery, was stationed in the west, and in 1827 resigned his commission. In 1829 he founded the *Morning Courier and New York Enquirer*, by uniting the *Enquirer* with the *Courier*, which he had then owned for two years; and was its editor and sole proprietor for about thirty years. In 1849 he entered the diplomatic service as minister to Austria; he was sent to Constantinople in the same capacity in 1861; and in the same year president Lincoln appointed him minister and envoy extraordinary to Brazil, where he remained until 1869, with the exception of an absence in Europe, in which he negotiated the secret treaty with the French emperor for the removal of French troops from Mexico. Since his return from Brazil, gen. Webb has resided in New York city.

WEBB, SAMUEL BLATCHLEY, 1753-1807; b. Wethersfield, Conn.; educated under the supervision of his step-father, Silas Deane, he was early taught, and deeply imbued, the political principles of American independence. Excited by the news from Lexington, young Webb left Wethersfield commanding a company, which he conducted to Bunker Hill. For his discretion and valor in that battle he was made a lieut. col., and private secretary to gen. Washington. He wrote the order announcing in New York July 9, 1776, the declaration of independence, and refused to receive a letter from lord Howe, directed to George Washington, esq. He fought bravely on Bunker Hill and Long Island, at White Plains, Trenton, and Brandywine. In 1777 col. Webb raised and equipped the 3d Connecticut regiment, commanding which he was taken prisoner and not exchanged till 1780. He then received, as brevet brig. gen. the command before held by baron Steuben. At his home in Wethersfield, in May, 1781 (the house is still standing, 1881), he entertained gen. Washington and count Rochambeau in their important conference. In 1783 he was one of the sixteen officers who formed the society of the Cincinnati. In 1789 gen. Webb married Miss Catharine Hogeboom, of Claverack, N. Y., where he afterward resided till his death in 1807.

WEBBE, SAMUEL, 1740-1816; b. Minorca, then an English possession; came to England, and for a time was apprentice to a cabinet-maker. He became a music copier, learned musical composition, and produced a great quantity of religious pieces, glees, catches, and songs, many of them of high merit. His knowledge of foreign languages was extensive. SAMUEL, his son, b. 1770, was also noted as a composer.

WEBBER, SAMUEL, D.D., 1759-1810; b. Mass.; graduated at Harvard, 1784; studied theology, and entered the ministry. He was professor of mathematics and natural philosophy in Harvard college, 1789-1806, and president of the college from 1806 until his death. He was one of the "boundary commissioners" appointed by our government to settle the dispute about the n.e. boundary.

WEBER, a co. in n. Utah, having the Great Salt lake for its w. boundary; drained by Weber river; containing a part of the Wahsatch range of mountains; 540 sq. m.; pop. '80, 12,597—8,710 of American birth, 53 colored. Co. seat, Ogden.

WEBER, ALBRECHT FRIEDRICH, b. Breslau 1825; studied in Breslau, Bonn, and in Berlin with Bopp, became an eminent Sanskrit scholar, visited England and France in 1846. In 1856 he was appointed extraordinary professor of ancient Indian languages and literature at Berlin; in 1867 full professor. He published *Indische Studien*, 10 vols. (1849-67), containing information in relation to the metrical system of Indian antiquity, etc. He has translated Indian dramas, and edited the *White Yajur-Veda*, 3 vols. (1849-59).

WEBER, CARL MARIA VON, a musical composer of high eminence, was b. at Eutin in Holstein, Dec. 18, 1786. Musical and dramatic talent had been hereditary in his family for some generations; his father, by turns officer in the army of the palatinate, finance minister of the elector of Cologne, music-director to the prince bishop of Eutin, and head of a company of strolling players, led a somewhat irregular and checkered life. Young Weber showed early a genius for music, but his instructors were often changed, in consequence of his father's change of residence. The teachers to whom he owed most were Haushkel at Hildburghausen, Michael Haydn at Salzburg, and Valesi and Kalcher at Munich. His father's impatience and want of judgment were injurious to him in many ways, particularly in the efforts made to bring him before the public prematurely as a musical prodigy. At the age of 13 he composed an opera called *Die Macht der Liebe und des Weins*. When but 14 his second opera, *Das Waldmädechen*, was brought out, without much success at first; but was afterward far better received than he himself thought it deserved. The next effort of the young opera composer was *Peter Schmolz und seine Nachbarn*, composed at Salzburg in 1801, and performed at

Vienna with but indifferent success. At Vienna he became acquainted in 1803 with Joseph Haydn and the abbé Vogler, and studied for some time under the latter. In 1804 he left Vienna, to be conductor of the opera at Breslau, and while resident there composed the greater part of his opera of *Rübezahl*. We next find him, in 1806, with prince Eugene of Württemberg at his court of Carlsruhe in Silesia, where he composed two symphonies and three concertos. In 1807 he went to Stuttgart, as private secretary to duke Ludwig, becoming also musical instructor to his children; and while there he composed the opera of *Silvana*, and a cantata called *Der erste Ton*, besides overtures, choral pieces, and piano-forte works. Getting into disfavor and pecuniary embarrassments, the result of his father's recklessness, he was dismissed the court of Württemberg, and took up his residence successively in Mannheim, Heidelberg, and Darmstadt, at which last place he composed his operetta of *Abu Hassan*. He then made a musical tour through Germany, during which his concerts were everywhere well attended. From 1813 to 1816 he was director of the opera at Prague, which he entirely remodeled; and during his residence in the Bohemian capital composed *Kampf und Sieg*, and numerous other songs, including that noble national series from Körner's *Leier und Schwert*, which had no little influence in rousing patriotic sentiment during the war of liberation.

In 1817 he was invited to form a German opera at Dresden; and there during the remainder of his life, he held the post of *kapellmeister* to the king of Saxony. To this period belong his most important compositions, including *Preciosa*, *Der Freischütz*, *Euryanthe*, and *Oberon*. None of these works, however, were first brought out in Dresden. The music to Wolff's *Preciosa*, the subject of which is taken from a novel by Cervantes, was first produced on the Berlin stage, where it made a powerful impression. The author's *chef-d'œuvre*, the opera of *Freischütz*, the libretto or which was written by the composer's friend, Friedrich Kind, also first saw the light in the Prussian capital in 1822. It was a great success; its novelty and beauty, as well as the deep thought contained in it, excited an extraordinary sensation throughout Germany, which soon extended to France and England. *Euryanthe*, produced in Vienna in 1823, was not quite so warmly received. Bearing more the impress of labor and cultivation, and less that of the composer's natural vein of romance, it has never been in such general favor as its predecessor. *Oberon* was written in prospect of a visit to London to a libretto supplied by Mr. Planché. When Weber set out for England, he was already struggling against mortal disease. On Mar. 8, 1826, he appeared at Convent Garden theater as conductor of a selection from *Freischütz*; and on April 12, following he also conducted, on the first appearance of *Oberon*, with applause on both occasions, incessant and uproarious. At his benefit concert on May 26, he was hardly able to go through the duty of conductor; and on June 5 he was found dead in bed in the house of sir George Smart, whose guest he was. He was interred in the Roman Catholic church, Moorfields; but in 1844 his body was removed to Dresden; and a statue of him by Reichel was erected in 1860 in front of the Dresden theater. Weber was married in 1818 to Carolina Brandt, an operatic singer of some note, daughter of Brandt the violinist, by whom he left a family.

The verdict of posterity, as well as of his contemporaries, has placed Weber in the first rank of musical composers. He was the first to use those bold effects of harmony and modulation whose introduction forms an era in the history of music. In his operas, the spirit of the romantic school appears in its brightest and most captivating form; and the overtures are masterpieces of imagination, each presenting an outline of the work to which it belongs. Besides the above operas and songs, his musical works are numerous, comprising concertos for the piano-forte, clarinet, oboe, bassoon, and violoncello—symphonies and overtures, one of the most beautiful and characteristic of them being the overture to the *Beherrscher der Geister*. Among his posthumous writings is an autobiography. His life has been written by his son, baron Max Maria von Weber, and recently translated into English by Mr. Palgrave Simson.

WEBER, WILHELM EDUARD, b. 1804, Germany; educated at Halle. In 1825, in association with his brother, he published *Die Wellentheorie*. He became assistant professor of natural philosophy at Halle in 1827, and professor of physics at Göttingen in 1831. He was removed from his position at Göttingen in 1837 for having protested against the violation of the constitution. He held the chair of physics at Leipsic, 1843-49, when he was restored to his former position at Göttingen. His researches on terrestrial magnetism in connection with Gauss are well known.

WEBSTER, a co. in s.w. Georgia, drained by Kinchafoona creek; 300 sq.m.; pop. '80, 5,237—5,235 of American birth, 2,571 colored. Co. seat, Preston.

WEBSTER, a co. in central Iowa, drained by the Des Moines and Lizard rivers; 720 sq.m.; pop. '80, 15,950—11,730 of American birth, 8 colored. Co. seat, Fort Dodge.

WEBSTER, a co. in w. Kentucky, having the Green river for its n.e. boundary; 400 sq.m.; pop. '80, 14,246—14,187 of American birth, 1667 colored. Co. seat, Dixon.

WEBSTER, a parish in n.w. Louisiana, drained by bayou Dorcheat, containing lake Bistineau in the s. portion; formed out of parts of Bossier and Claiborne counties; pop. '80, 10,005—9,924 of American birth, 5,682 colored. Co. seat, Minden.

WEBSTER, a co. in s.w. Missouri; drained by the Niaugua river, the James river, and Finley creek; 540 sq.m.: pop. '80, 12,176—12,045 of American birth, 248 colored. Co. seat, Marshfield.

WEBSTER, a co. in s. Nebraska, drained by the Republican river; 576 sq.m.: pop. '80, 7,108—6,120 of American birth, 5 colored. Co. seat, Red Cloud.

WEBSTER, a co. in central West Virginia; 400 sq.m. pop. '80, 3,207—3,187 of American birth, 2 colored. Co. seat, Webster Court-House.

WEBSTER, BENJAMIN, b. England, 1800; educated for the navy, but at the close of the war in 1815 began the study of music. He made his first appearance on the stage in 1825. He was soon recognized as one of the first actors of the time. In 1837 he became manager of the Haymarket theater, where Macready, Wallack, Matthews, Miss Faucit, and other eminent actors appeared, and for which Bulwer, Knowles, Jerrold, Bernard, and others wrote dramas. He was afterward manager of the new Adelphi theater, and the Olympic, from which he retired in 1874.

WEBSTER, DANIEL, American statesman and jurist, was b. at Salisbury, N. H., Jan. 18, 1782, the second son of Ebenezer Webster, a small farmer, and justice of the county court. He entered Dartmouth college in 1797, and taught school in winter to pay his expenses, and aid his brother, Ezekiel, who became a distinguished lawyer, in fitting for college. On graduating in 1801 he commenced to study law, but was induced, by the offer of a salary of \$350 a year, to become preceptor of an academy at Fryburg, Me., paying his board by copying deeds. In 1804 he went to Boston, and entered the law office of Mr. Gore, refusing an appointment of clerk of the court of which his father was a judge, at \$1500 a year. In 1805, having been admitted to the Boston bar, he established himself at Portsmouth, N. H.; married in 1808; and having engaged in politics as a member of the federalist party, was elected to Congress, where he immediately took rank with the foremost men of the country. His speech on the Berlin and Milan decrees, and his mastery of the questions of currency and finance, gave him a high position; but he determined, in 1816, to remove to Boston, where, leaving politics, he engaged for several years in legal practice of the most extensive and varied character. In 1822 he was a member of the Massachusetts constitutional convention; and Dec. 22, 1822, he pronounced at Plymouth, on the anniversary of the landing of the Pilgrims, the first of that remarkable series of discourses, or orations, which gave him the first rank among American orators. In 1825 he gave an oration at the laying of the corner-stone of the Bunker Hill monument; in 1843, one on its completion. In 1826 he pronounced the eulogy of John Adams and Thomas Jefferson, two fathers and presidents of the American republic, who died on the same semi-centenary anniversary of the declaration of independence; and in 1851 a patriotic discourse on the laying of the corner-stone for the extension of the capitol at Washington. In 1822 he was elected to congress from Boston, and was distinguished by his speeches on the holy alliance and the Greek revolution, and his labors in the revision of the criminal laws of the United States. In 1826 he was chosen senator; and in 1830 rose to the height of his forensic renown in a speech of two days, in the debate with Mr. Hayne of South Carolina, on the right of "nullification." Webster and Clay were the leaders of the opposition during the administrations of Jackson and Van Buren. In 1839 he visited England, Scotland, and France; and in 1841 accepted the post of secretary of state in the cabinet of gen. Harrison, and remained in that of Mr. Tyler, who, as vice-president, succeeded on the death of the president, until 1843. In 1844 he aspired to the presidency, but the choice of his party fell upon Mr. Clay, whom he supported, but unsuccessfully. He was chosen senator for Massachusetts, and again, in 1848, was disappointed of the presidential nomination by the popular enthusiasm for the victor of Buena Vista, gen. Taylor. His senatorial efforts at this period were directed to the preservation of the union by the advocacy of compromises on the slavery question, and he gave offense to the abolitionists by defending the fugitive slave law. In 1850 he became again secretary of state in the cabinet of Mr. Fillmore; and in 1852 was once more, and no doubt grievously, disappointed at not receiving the nomination to the presidency, which was given to gen. Scott. He did not live to see the defeat of his rival; but, after a brief illness, died at his country residence at Marshfield, Mass., Oct. 24, 1852. Mr. Webster was a man of very striking appearance, large, swarthy, with deep set eyes, a deep powerful voice, and a solemn and earnest manner. His collected writings and speeches have been published (6 vols. Svo, 1851), and his correspondence (2 vols. Svo, 1855).

WEBSTER, DANIEL, LL.D. (*ante*), was b. in a frontier settlement where schools and competent teachers were almost unknown, and received his early education mostly from his father, in the brief intervals of a farmer's domestic labors. After less than a year of preparation in a classical academy, and in the family of a country clergyman, he entered Dartmouth college before he was 15 years of age, yet such was his force of character that he soon became first in his class, and held that rank till he graduated in 1801. Through the required course of reading and study for the profession of law he supported himself by teaching, copying legal documents, and reporting cases decided in the state and U. S. courts. Admitted to the bar, he soon became widely known, and rapidly rose to honorable recognition in the courts, where he often conferred with such distinguished jurists as Joseph Story, Samuel Dexter, and Jeremiah Mason.

The war of 1812 called into public life the strongest men of both political parties, and Webster, having adopted and advocated the principles of the party opposed to the war, was elected to represent the people of New Hampshire in congress. His reputation for thorough acquaintance with public affairs, domestic and foreign, preceded him and secured him influential positions on the most important committees. His speeches for the repeal of the embargo, and the increase of the navy, and on the great financial questions which then agitated and divided the nation, evidenced a comprehensive and deep insight into the principles involved, and the immediate necessities of the nation, as well as a firm adherence to the measures of the party he represented. They were imbued with such a spirit of lofty patriotism, and uttered with such manifest sincerity, that they secured for him, in congress and through the country, universal respect.

After twice representing New Hampshire in congress, Mr. Webster made Boston his permanent home; and such was the general conviction of his superiority as a counselor and advocate, that the most important business in the highest courts of the country seemed by common consent to fall into his hands, and his clients were never disappointed in their expectations as to his ability or integrity. In the celebrated case of Dartmouth college he supported his final argument with an array of judicial opinions and decisions so extensive and so pertinent to this case, and with appeals so convincing, that chief justice Marshall rendered the unanimous opinion of the U. S. supreme court, reversing the decisions of the state tribunals, and restoring the old board of trustees to their claimed right of property and jurisdiction. In conducting this important and difficult case through all its intricacies, and over all obstacles, to this successful termination, Webster far surpassed public expectation, and laid a solid foundation for his future popularity and success as a constitutional jurist and advocate.

In the trial of the Knapps, in Salem, for the murder of Crowninshield, and in the Girard will case, where he was, however, successfully opposed by that distinguished advocate, Horace Binney, Mr. Webster displayed mastery of the legal points involved, industry and discrimination in selecting and arranging judicial opinions and decisions, and oratorical powers to chain the attention and fasten the intelligent and moral conviction on both the learned and the unlearned. In his youth he made a public profession of religion, and through all his life was a diligent student of the Bible. Not long before his death he dictated, to be inscribed on his tombstone, a declaration of his unwavering belief in Christianity.

WEBSTER, EBENEZER, 1739-1806; b. N. H.; a soldier under Amherst in the French war. Settling in Salisbury, now Franklin, N. H., he kept a tavern, and had a farm until the outbreak of the revolutionary war, when he led a company of militia to join the continental army at Cambridge. He served through the war, at whose close he was a col. of militia. He served in both houses of the New Hampshire legislature, and from 1791 till his death was judge of the Hillsborough co. court of common pleas.

WEBSTER, HORACE, 1794-1871; b. Vt.; graduated at West Point, 1818, and was commissioned in the infantry. He was assistant professor of mathematics at the military academy for seven years; in 1825 resigned his commission and became professor of mathematics and philosophy in Geneva (now Hobart) college. In 1848 he was made president of the New York free academy, now known as the college of the city of New York. From 1852 to 1869 he acted as professor of moral, political, and intellectual philosophy, as well as president, and in the last named year became professor *emeritus*.

WEBSTER, JOHN, b. England, late in the 16th c.; the associate in play-writing of Rowley, Marston, Dekker, Drayton, and others. His best dramas are *The White Devil* (1612); and *The Duchess of Malfy* (1623).

WEBSTER, NOAH, American author and philologist, was born at Hartford, Conn., Oct. 16, 1758, and entered Yale college in 1774. In his third college year, he served under his father, a militia capt. in the war of the revolution. He was admitted to the bar in 1781, but engaged in scholastic and literary occupations. Employed in teaching a school at Goshen, N. Y., he prepared his *Grammatical Institutes of the English Language*, published in three parts; and edited *Governor Winthrop's Journal*. In 1785, he wrote *Sketches of American Policy*, advocating the formation of a new constitution, and gave public lectures on the English language, which were published in 1789. He taught an academy in Philadelphia, and wrote on the constitution; and in 1788, published the *American Magazine* in New York. After a few years' law practice at Hartford, he engaged, in 1793, in the editorship of the *Minerva*, a federalist daily paper in New York. In 1799, he published *A Brief History of Epidemic and Pestilential Diseases*, the yellow fever having broken out in New York; and pamphlets on international law, banking, and finance. In 1807, he published *A Philosophical and Practical Grammar of the English Language*, and commenced his *American Dictionary of the English Language*; but finding difficulties in etymology, he devoted ten years to its study, and prepared a *Synopsis of Words in Twenty Languages*; then began his dictionary anew, and in seven years completed it. In 1824, he came to Europe, to consult books and learned men, spending some months at Paris and Cambridge. In 1828, an edition of 2,500 copies of his dictionary, in 2 vols. 4to, was issued; followed by one of 3,000 copies in England.

Numerous abridgements have been made, which found a large sale. His *Elementary Spelling-book*, founded on his *Institutes*, up to 1863, had been sold to the extent of 41,000,000 copies. A new and thoroughly revised and enlarged edition of his dictionary was finished in 1866, and it is now perhaps the most complete dictionary of the English language yet published. Mr. W. also published a popular *History of the United States*, and a *Manual of Useful Studies*. He was a judge, a member of the state legislature, and one of the founders of Amherst college. He died at New Haven, May 28, 1843.

WEBSTER, NOAH, LL.D. (*ante*). He published, 1783, in the *Connecticut Courant*, a series of papers signed Honorius, in defense of the soldiers' pay-bill; the same year his spelling-book. He traveled in the south to procure the enactment of state copy-right laws, the confederation not having the requisite power. The publication of the *American Magazine* in New York, on which he sustained a heavy loss, he relinquished, 1789; returned to Hartford, and after some years' successful practice of law, established in New York, 1793, a daily newspaper, *The Minerva*, and a semi-weekly edition, *The Herald*, for the support of the national administration. These names were afterward changed to *Commercial Advertiser* and *New York Spectator*. In 1795 he wrote for his paper a series of able articles under the signature of Curtius in defense of Jay's treaty with England, concluded the previous year. In 1798 he terminated the editorial connection with his journal and removed to New Haven; published, 1806, a *Compendious Dictionary*, and soon began the preparation of his *American Dictionary of the English Language*. In 1840 a second edition of 3,000 copies was issued in 2 vols. royal 8vo. While preparing this work he removed to Amherst, Mass., where he united with others in founding Amherst college, and was for several years president of its board of trustees. He represented the town in the legislature. He had been a member of the Connecticut legislature, and a judge of one of the state courts. He returned to New Haven, 1822. A short time before his death, which occurred 1843, he revised the appendix to his dictionary. A third edition, revised and enlarged by professor C. A. Goodrich, appeared, 1848; a fifth, greatly improved by professor Goodrich and president Porter, with numerous pictorial illustrations (1864); the sixth and last was issued, 1880. Of the *Elementary Spelling-book* more than 70,000,000 copies had been sold up to 1876. Besides the works named Dr. Webster published *Letters to a Young Gentleman Commencing his Education*; *The Prompter*; *History of Animals*; *A Collection of Papers on Political, Literary and Moral Subjects*; *The Holy Bible, with Amendments of the Language*, a revision of the English version.

WEBSTER, THOMAS, b. London, 1800; became an art student in the Royal academy, 1820, and in 1825 obtained the first medal in the school of painting. His first picture, "Rebels Shooting a Prisoner," was exhibited the same year, and since then he has painted a very large number of popular pieces, most of them relative to the school and play-life of children. Among the best are "Football," "The Smile," and "The Frown," and "Dotheboy's Hall." Mr. Webster became a member of the Royal academy in 1840.

VEDDAHs, or VEDDAHs, descendants of the original inhabitants of Ceylon, who were conquered and nearly exterminated by the Singhalese, 543 B.C., under Wejaga, the first Singhalese king. They inhabit chiefly the great forests of the interior, and also the most inaccessible parts of the central table-land. They are divided into two tribes, the *forest* and *village* Veddahs. The former have neither clothing nor habitations, subsist on wild fruits and animals, and rests on the branches of large trees. The latter, the more civilized, occasionally go down to the lower districts to exchange their game and cattle for rice, cloth, iron, etc. They live in huts of bark and mud, and cultivate the ground, though, like their more savage brethren, they seek their chief subsistence in the forests. They are peaceable, not disposed to begin an insurrection, though easily persuaded to join one. An intelligent Kandyan, who had been for months in the Veddah country, informed a Wesleyan missionary that the Kandyans call the *forest* Veddahs *leaf* Veddahs, because their dress is made of leaves tied with a string, the *village* Veddahs having a piece of cloth half a yard square as their dress; that the former often sleep in hollow trees, of which there are many, and in caves; and that their language is entirely different from that of the latter, which is a kind of Singhalese; that they commonly go two or three together, and have a head man or chief, to whom they render a kind of subjection. Without acknowledging British rule, they pay a small tribute of wild honey, etc. They have a sort of religion somewhat resembling the Brahmanical. Mr. Boyd, in the *Asiatic Annual Register*, remarks: "This extraordinary race exhibits the phenomenon of a people living for a series of ages almost in a state of quiescent barbarism, with the example of arts and civilization almost perpetually before their eyes."

WEDDERBURN, JAMES, 1500-64; b. Scotland; edited with his brother Robert a work entitled *Ane Compendious Buik of Godly and Spirituall Songs, collectit out of Sundrie Partes of the Scripture, with sundrie of uther Ballades changed out of Prophane Songs for avoyding of Sinne and Harlotrie*. This was the principal psalm-book used in Scotland. It was re-published by sir J. G. Dalyell in his *Scottish Poems of the Sixteenth Century*. To Wedderburn is attributed also *The Complaynt of Scotland*, said to be the only classic work in old Scottish prose.

WEDGE, one of the mechanical powers, and in principle a modification of the inclined plane. The power is applied by pressure, or more generally by percussion to the back, thus forcing the edge forward. The wedge is employed for such purposes as the splitting of wood, the fastening firmly of the handle of an axe, the raising of a ship in a dry dock, etc. The investigation on statical principles of the mechanical advantage of the wedge is extremely unsatisfactory, the power, which is scarcely ever a "pressure," being always assumed to be one, and the enormous friction on the sides of the wedge being generally neglected; the theoretical result thus arrived at is that the pressure applied at the back: the resistance or weight: $\frac{1}{2}$ width of back of wedge: length of side. In the application of the wedge to the splitting of wood in the direction of the fibres, the split generally extends some distance in advance of the edge of the wedge, and the action of the latter is then a combination of the action of the wedge with that of the lever; in fact, this compound action is found more or less in all applications of the wedge as a cutting or splitting weapon, and tends further to complicate the statical investigation of its mechanical properties. The best and simplest illustrations of the single wedge are axes, nails, plugs, planes, chisels, needles, and all sharp-pointed instruments.

WEDGWOOD, JOSIAH, the creator of British pottery as an art, was b. at Burslem in Staffordshire, in the year 1730. His father was a potter, and very early he was set to work at the same business. His education seems to have been of the scantiest. After an abortive attempt to settle himself at Stoke with a partner named Harrison, he returned to his native place, and there commenced business as a potter. From the first, his ardor for the improvement of the manufacture was conspicuous. His first efforts were directed to the refining of the material, and soon he succeeded in producing a beautiful cream-colored porcelain, which became popularly known as queen's ware, queen Charlotte having much admired it, and extended her patronage to the manufacturer. Subsequently other improved materials were produced. The attention of Wedgwood was not less assiduously directed to consideration of form and decoration; he busied himself in emulating the grace of the antique models; and the celebrated sculptor, Flaxman, was employed to furnish designs to him. In this way what he found a rude and barbarous manufacture, he raised to the level of a fine art; and he found his reward in the speedy amassing of an immense fortune. In 1771, he removed his works some little way from Burslem; and to the new site he gave the fanciful name Etruria, as that of the country of old most celebrated for the beauty of its ceramic products. Here he built himself a splendid mansion; and here, in 1793, he died.

Apart from his eminence in the art to which he mainly devoted himself, Wedgwood was a man of considerable culture. Natural philosophy, in particular, he studied with much success. He was a fellow of the Royal society, as also of the society of Antiquaries; and to the *Philosophical Transactions* he from time to time contributed papers. He likewise interested himself deeply in all matters of public concernment; and mainly through his influence it was that the Grand Trunk canal, uniting the waters of the Mersey, the Trent, and the Severn, was carried out. He was a man of much benevolence of character, and the prosperity which flowed upon him through life, he distinguished by the exercise of an almost princely liberality.

Full particulars as regards this remarkable man may be found in two lives of him published in 1865, one by Eliza Meteyard, the other by Llewellyn Jewett. See also Eliza Meteyard's *Memorials of Wedgwood* (1875), and *Wedgwood Handbook* (1875).

WEDGWOOD WARE, a beautiful kind of pottery invented by Josiah Wedgwood in 1775. It consists of flint, Potter's clay, carbonate and sulphate of barytes, and zaffre, or some other coloring material. It is also called jasper ware. The beautiful classical designs on the earliest productions of this manufacture were many of them executed by Flaxman, and are very highly valued.

WEDNESBURY, a market t. in the s. of Staffordshire, in a district abounding in canals, coal mines, and iron-works, $7\frac{1}{2}$ m. n.w. of Birmingham by railway. It was called Weadesbury by the Saxons, and for a long time took precedence, in point of population and historical importance, of Birmingham and Wolverhampton. It was here that the great coal-field of Staffordshire was first worked. Wednesbury contains large works for the manufacture of railway plant; it produces also edge-tools, coach ironmongery, locks, screws, gun-locks and barrels, gas and water pipes. The town has been greatly improved by a local board of health, appointed in 1865. By the reform act of 1867, Wednesbury—comprising also Bromwich and Tipton—was erected into a parliamentary borough, returning one member to the house of commons. Pop. '71, of town, 25,030; of parliamentary borough, 116,809.

WEDNESDAY, the fourth day of the week, the *Dies Mercurii* of the Romans, the *Mittwoch* (mid-week) of the modern Germans. The name Wednesday is derived from the northern mythology, and signifies Woden's or Odin's day. The Anglo-Saxon form was *Wōtan's dag*, the old German *Wuotanes tac*. The Swedish and Danish is *Onsdag*.

WEE BO, or IBO, a small island off the coast of Mozambique, belonging to the Portuguese, about 150 m. s. of cape Delgado. The town is clean, with neatly-built houses; there are three forts, one of which serves as barracks for the garrison, and, though contemptible as a defensive work against a well-organized enemy, it is well adapted for resisting the natives, between whom and the Portuguese all along the Mozambique coast, there

seems to be perpetual hostility. The pop. consists of nearly 3,000 natives and a few Europeans; and though an important trade in ivory, copal, etc., is said to be carried on, there are few signs of activity in the harbor, and the natives for the most part seem miserable, fever-stricken wretches.

WEED, *Lymphangitis*, or a shot of grease, consists in inflammation of the large absorbent glands and vessels situated between the horse's thighs. Rarely, it attacks the corresponding structures between the fore-limbs. It occurs in round-limbed, indifferently bred, hard-wrought horses; appears particularly after a day or two of rest, after exposure to cold, or during imperfect action of the bowels; and is said to depend upon more blood being produced than is required to replace the natural waste of the body. It is identified by lameness, tenderness in the groin, and fever. The horse must be bled, have a full dose of aloes, and when the pain and tenderness are great, ten drops of Fleming's tincture of aconite in water every two hours; the limb should be bathed for at least six or eight hours continuously in hot water, and then rubbed dry and kept warm. The subsequent swelling will be reduced by saline draughts, diuretics, rubbing of the limb, and exercise.

WEED, STEPHEN H., 1834-63; graduated at West Point in 1854, and was appointed to the artillery. He took part in the Florida war and the Utah expedition. He was made capt. in the artillery in 1861, was attached to the army of the Potomac in 1862, and served through the peninsular campaign, showing great gallantry at Antietam and Chancellorsville. Soon after the latter battle he was made brig. gen. of volunteers. He was killed at Gettysburg at the head of a brigade of regulars in the 5th corps.

WEED, THURLOW, American journalist, was b. at Cairo, N. Y., Nov. 15, 1797, and at the age of 10 years was cabin-boy on a sloop on the Hudson river; at 12 he was an apprentice in the printing-office of Mr. Croswell, at Catskill; then lived for a short time in a backwoods settlement, but at 14 returned to printing. He was a volunteer in the war of 1812, and at the age of 21 established a newspaper in western New York, and during the anti-masonic excitement, was elected to the state legislature, 1826-27, where his peculiar and almost unrivaled abilities as a political manager or "wire-puller" were early recognized. In 1830 he settled at Albany, the state capital, and commenced the publication of the *Evening Journal*, an anti-Jackson, whig, or republican paper, which became the organ of the party, and of the state government when its party was in power. Declining all offices for himself, except the profitable one of state printer, he is supposed to have exercised almost supreme influence in nominations and appointments, and to have secured the choice of presidents Harrison and Taylor; was through his whole career, the friend and adviser of Mr. Seward. In 1861 he was sent in a semi-diplomatic capacity to Europe, and on his return was presented with the freedom of the city of New York, where he became part proprietor and one of the editors of the *New York Times*, and subsequently editor of the *Commercial Advertiser*. In 1866 he published *Letters from Europe and the West Indies*.

WEEDON, GEORGE, b. Fredericksburg, Va.; at the outbreak of the revolutionary war was commissioned lieut. col. in the Virginia troops. At Brandywine he was at the head of one of Greene's divisions, and to him is ascribed the honor of stopping the British pursuit and saving the patriot army. He also served with credit at the battle of Yorktown and elsewhere.

WEEDS, the name given to all those plants which grow wild in cultivated grounds, and injure the crops; which they do both by choking them, and by exhausting the soil. Those weeds which are annuals or biennials, as charlock, yellow rattle, and melilot, may gradually be got quit of by merely cultivating, for a succession of years, such plants as are to be cut before the seeds of the weeds are fully ripe. Perennial weeds, such as couch grass, can only be removed from the ground by repeated and careful tilling; and for this purpose, crops which require much hoeing are advantageously planted, and recourse is had to summer fallowing in fields, and frequent weeding in gardens. Thistles and other large weeds are frequently pulled in corn fields before the corn comes into ear, and to prevent their seedling, they are cut in pastures. Sedges and rushes, which spring up in great abundance in damp grounds, disappear on thorough draining. Leafy crops which thickly cover the soil, prevent the growth of many weeds by the exclusion of air and light. Weeds which have been rooted up form excellent compost for manure. Those which make their appearance in fallow grounds serve for green manuring when they are plowed down.

WEEK (Goth. *Wico*; Old High-German, *Wichha* = order, cycle (?); Lat. *Vicis*; Gr. *Hedonias*, *Sabbaton*; Heb. *Shabua*, from *Sheba*, seven) designates generally a period of seven days. It was probably first instituted as a kind of broad subdivision of the periodical month, corresponding to the four quarters of the moon, or about 7½ days. Although found as a civil institution among some nations at the earliest time—e.g., with the Hindus, Assyrians, Persians, etc., it is only with the Jews that we see a religious significance given to the concluding or seventh day of that period itself. Both their cosmogony and legislation are connected with it. The Sabbath (q.v.) is emphatically the day of rest, while seven weeks after the Passover, the Pentecost or feast of weeks takes place, etc. (see SEVEN). It is doubtful whether it was through the Jews that this com-

putation of weeks was introduced to the Egyptians, but it is certain that the latter at an early period counted seven periodical days, naming them according to the seven planets then assumed. The application of the names of the planets to the days of the week in the order they now stand, originated in this way: It was an astrological notion that each planet in order presided over an hour of the day, the order, according to their distances from the earth, being, on the geocentric system, Saturn, Jupiter, Mars, the sun, Venus, Mercury, the moon. Assuming Saturn to preside over the first hour of Saturday, and assigning to each succeeding hour a planet in order, the 23d hour will fall again to Saturn, the 23d to Jupiter, the 24th to Mars, and the first hour of the next day to the sun; in the same way, the first hour of the following day falls to the moon, and so on. From Alexandria this seven-days' week was imported, together with the names of the individual days, to the Greeks—who previously divided their months into three decades—and to the Romans, about the time of Christ. Rome had previously counted her periods by eight days, the eighth day itself being originally called *Nundina*—a term later applied to the whole cycle—as returning *novo quoque die*, when the country people were in the habit of coming to town for the purposes of business, and chiefly to inquire after public news, the changes in government and legislation, vacant places, and the rest. But the seven days' cycle soon found great favor among the Romans, owing partly, perhaps, to the spread of Egyptian astrology, although the change was not officially introduced before Constantine. It is certain that the Jewish name Sabbath came into use in Rome, and from Rome it spread to all the Romanic languages, even into the German. It survives in the Italian *Sabbato*, the Spanish *Sábado*, the French *Samedi* (*Sabbati dies*), and the German *Sambaztag*, which afterward became *Samsstag*. In the same manner, the Latin *septimana* (the Greek *hebdomas*) had become the modern designation for week in the Italian *settimana*, Span. *semana*, French *semaine*, and even in the Irish *seachtmaine*. The *Codex Theodosianus* is the first document which adopts the term *septimana* in the meaning of weeks. The Jews, as well as the early Christians, had no special names for the single days, but counted their number from the previous Sabbath, beginning with Sunday, as the first after the Sabbath, and ending with Friday, as the sixth after the previous, or eve (*Ereb*) of the next Sabbath. After a very short time, however, young Christianity, which in the same manner had endeavored to count from the *feria secunda*, or second day after Sunday, to the *Septima* (or Saturday), had to fall back again upon the old heathen names, previously introduced in Gaul, Germany, etc., by the heathen Romans. The Sunday, or *dies Solis*, alone was changed in many of the Romanic languages in accordance with the new creed. It was called *Kyriake*, *dies Dominicus*, or *Dominica*, the day of the Lord, a term which in Italian became *Domenica*, in Spanish *Domíngo*, and *Dimanche* in French. The Germanic *Frōntac* (from *frōu* = *domineus*) occurs but once. It is very curious to notice how the names of the five days of the week which followed those named after the sun and moon, became Germanized, as it were, or the names of the originally imported gods translated into those of the Germanic divinities. Thus, the day of Mars became that of Ziu (see *TYR*). Mercury became Wodan; and the fourth day was called after the latter, in Dutch, English, and Scandinavian; while in Germany it was simply called the middle of the week = *Mittwoch*. The day of Jupiter became the day of Thor = Thursday, *Donnerstag*; while the *Dies Veneris* was transformed into the day of Freya, the wife of Odin (Wodan). The day of Saturnus, retained under this name in some northern tongues, became a *langardage*, or bathing-day, in others; while in upper Germany it remained a Sunday-eve (*feria ante dominicam*) or *Samstag* (see above). From recent discoveries of Assyriologists, it seems certain that the Assyrians, and through them probably the other Semitic nations, derived their week of seven days from the Accadians or early Turanian inhabitants of Babylonia, who also observed the seventh day as a day of rest. To this remarkable people are also to be traced the planetary names which we still give to the days of the week. The Arabs, like the Jews, count their days (beginning and ending with sunset) by sevens, without giving them planetary names. Greeks, Slaves, and Finns also count their days from Sunday, instead of naming them. The French revolution altered the seven-days' week into a decade of 10 days; but the new computation introduced in 1793 was abrogated again in 1805. The "weeks of years" in Hebrew prophetic poetry (like the Roman *annorum hebdomade*) indicates cycles of seven years.—See Ideler's *Chronologie* (1831); Grimm's *Deutsche Mythologie* (1835); and Lenormant's *La Magie chez les Chaldéens* (1874).

WEEKES, HENRY, 1807-77; b. England; studied sculpture at the Royal academy. He was long an assistant of Chantrey. Among his works are statues of Charles II., Bacon, Latimer, Ridley, Cranmer, and others. He became a member of the academy in 1863, and was professor of sculpture there from 1873.

WEEKS, FEAST OF (Gr. *Pentecoste* = fiftieth, Heb. *Shabuoth*, also called feast of harvest, day of the first-fruits, etc.), the second of the three great *regalim* or pilgrim feasts of the Old Testament, was celebrated seven weeks, or forty-nine days, after the passover. As the latter was the feast of the barley harvest, so the former was that of the wheat-harvest. The first two loaves of the new crop were offered up on the day of the festival—leavened, and containing about $3\frac{1}{2}$ quarts each (the Mishnah speaks of their being 7 in. by 3), together with a peace-offering of two lambs. Besides this, a great burnt and sin offering—the former consisting of seven lambs, a bullock, two rams, to-

gether with the appropriate meat and drink offerings; the latter of one kid—were added, according to Leviticus (xxiii. 18); while Numbers (xxviii. 27) increases the number of the bullocks to two, and only mentions one ram—a number more in accordance with the regulations for the other festive sacrifices. The Jewish tradition, however, considers the animals mentioned in the later passage as an additional sacrifice; and Josephus has indeed added both up, except in as far as the rams are concerned, of which he only gives two. Tradition has given to this feast, which originally was only intended to represent the solemn closing of the harvest, a new significance by making it the anniversary of the Sinaitic legislation, which indeed must have taken place in the first days of the third month. But the pentecost, which is always fixed in the Jewish calendar on the 6th of Sivan, could not, before the establishment of astronomical computation, fall always on the same day, but must needs have fallen between the 5th and 7th of that month. Moses himself nowhere fixes the date of this festival as he does with the others. The Karaites, instead of referring the "morning of [after] the Sabbath" of Lev. (xxiii. 15) to the 16th of Nisan, take it literally, and celebrate the festival always on a Sabbath. The uncertainty of the lunar calculation and observation among the Jews of the dispersion, caused them also to add one day to this festival—a usage still retained at present. There seems to have been more of the character of a harvest-home inherent in this festival than in the passover, which partook particularly of the character of a large and solemn family-gathering. For the Christian adoption of this festival, see PENTECOST.

WEENIX, JAN BAPTIST, the elder, 1621-60; b. Amsterdam; studied at Utrecht, and with Nicholas Moijert, whose style of painting he followed. He also lived four years at Rome. Though but 39 years of age at his death, he produced pictures in every department of painting, historical, portrait, animal, landscape, and marine. His son JAN, the younger, 1644-1719, was also a painter of merit, and excelled in hunting and sporting pieces.

WEeping TREES are trees with remarkably elongated and pendulous branchlets, generally mere varieties of species which ordinarily have a different habit, as the weeping birch, weeping ash, and weeping willow, which are varieties of the common birch, common ash, and white or Huntingdon willow. The weeping birch occurs in a wild state in some places in the Highlands of Scotland, and is a characteristic ornament of the landscape. Trees intermediate in their habit between the weeping birch and the common variety are of very frequent occurrence. Weeping trees are much esteemed for ornamental purposes, and are not only very beautiful in themselves, but as a contrast to other trees in lawns and pleasure-grounds. They are therefore carefully propagated in nurseries. The weeping ash is often grafted on the common ash, but the result is seldom very satisfactory, the art of the gardener forcing itself too much upon attention. A tendency to the weeping habit of elongated and pendulous branchlets is manifested in some kinds of trees, as the tendency to vary into a very opposite habit, with the branchlets drawn up close together (var. *stricta* of botanists), appears in others, of which the Swedish juniper and the Irish yew are familiar examples.

WEERT, an unwall'd t. in the Netherlands, province of Limburg, 12 m. w.n.w. of Roermond, on the ship-canal from Maastricht to 's Hertogenbosch. Pop. '75, 7,136. There are several good schools, a collegiate institution, town-house, two churches, and three market-places. In the church of St. Martin is the grave of the count of Hoorn, who was beheaded at Brussels, in 1568, for adhering to the prince of Orange in the struggle for religious and political freedom. A beautiful promenade leads to the other church, outside the town, n. of which are the ruins of the old castle. Besides the markets for farm produce, horses, and pigs, Weert has factories for making cloth, stockings, and hats, corn and oil mills. Here was born, 1594, Jan van Weert, who, in boyhood a shoemaker's apprentice, became commander of the Austrian army and viceroy of Bohemia.

WEEVER, or STING-FISH, *Trachinus*, a genus of acanthopterous fishes of the family *arenoscopidae*, also called *trachinidae*. In this family the ventrals are composed of a spine and five jointed rays, and are generally situated before the pectorals. The scales are cycloid, or wanting. The eyeballs are capable of being raised in a remarkable manner out of their sockets, and of being retracted again to the level of the orbits. The species frequent the bottom of the sea. They are often furnished with barbels, and have also a peculiar membranous filament under the tongue, which they can protrude at pleasure. In the genus *trachinus* the head is compressed, the eyes are placed high and close together; there is a long sharp spine on the hinder part of the gill-cover. There are two dorsal fins; the second dorsal and the anal are long; the ventrals are close to the throat. Two species are found on the British coasts, the GREATER WEEVER or STING-BULL (*T. draco*), and the LITTLE WEEVER or VIPER WEEVER (*T. vipera*). The former attains a length of nearly one foot; the latter seldom of more than four or five inches. The general form, is long, narrow, and compressed; the little weever is proportionally deeper in body than the greater weever. The head of both is short, compressed, flat between the eyes, and rough on the summit; both dorsals and the anal fins are spiny; and in both the gill-cover is furnished with a strong and sharp spine, which is directed backward, and can be appressed to the body, but which is also capable of being made to stand out

so as to present its point to an adversary. Both species are of a yellowish brown color. They inhabit parts of the sea having a sandy bottom, and often partially bury themselves in the sand, but are ready to move off with great celerity if disturbed. They can live long out of the water; and if left by the retiring tide suffer no inconvenience. If assailed they can, by a sudden bending of the body, make use of one of the strong spines of the gill-covers against the assailant; and the wound thus inflicted is so severe as to lead to the opinion that the spine is coated with a venomous exudation. Naturalists, however, generally supposed the popular opinion to be erroneous, and the severity of the wound to be merely owing to the laceration effected by the spine, until it was discovered by Dr. Günther, in 1864, that poison-glands existed in connection with spines of some South American fishes of the family *siluridæ*. A peculiar stinging sensation attends a wound by a spine of a weever, which extends far up the arm, if the wound has merely been in a finger, and is much more severe than the pain of a wasp-sting. There is also a groove in the spine, which has perhaps something to do with the conveyance of the poison; but no poison-gland has yet been proved to exist. In France the fishermen are required, under a penalty, to cut off the spines of weevers before selling them. Weevers are esteemed for the table.

WEEVIL, *Curculio*, a Linnean genus of insects, now forming the tribe *rhynchophora*, of the order *coleoptera*, and section *tetramera*. They are remarkably characterized by the prolongation of the head into a beak or snout, at the extremity of which the mouth is placed, and from which the club-shaped antennæ spring. Some of them have straight antennæ; but the greater number have the antennæ *geniculated*, or bent forward at the second joint. The species are very numerous, and are distributed over all parts of the world. They all feed on vegetable food, both in their larval and in their perfect state; and some of them are notable for the mischief which they do in the former state to the young shoots, leaves, fruits, and seeds of plants. They are diurnal insects, many of them very small, but others of considerable size. They are slow, timid, and defenseless; although the long hard beak suggests to those ignorant of its real nature and of their habits an idea of danger in handling the larger species. Many of them are of very dull and uniform color; but some are among the most beautiful of the *coleoptera*—resplendent with the finest hues, and brilliant as gems. Such is the well-known diamond beetle (q.v.) of South America. The larvæ of weevils are soft, white, and footless, with very convex rings, hard heads, and horny jaws. The perfect insects are often found on leaves and in flowers of the particular kinds of plants on which they and their larvæ feed. *Rhynchites betuleti*, a weevil often very injurious to vineyards, constructs a nest for its larvæ by rolling up the leaf of the vine, piercing the roll as it proceeds, and depositing eggs between the folds in the inner part of the roll. The larvæ feed upon the leaf, which the parents further adapt for their use by cutting the leaf-stalk half through, so that the leaf hangs down, and by the time they are ready to change into the chrysalis state, it drops off, or is blown off by the wind, when they bury themselves in the ground to wait for the return of spring. Other trees, as the pear-tree, are infested by weevils which destroy their leaves in a similar manner; the leaves of some, as of the peach, often suffer injury from weevils, which devour them, like caterpillars, without rolling them up; and turnips are subject to the ravages of certain small species of weevil, which proceed in the same manner. Some species of weevil gnaw young shoots. The shoots of fruit trees, and young grafts, are sometimes destroyed by weevils, which bore into them by means of their beak, and make a small chamber in the center, in which an egg is deposited, being pushed into its proper place by the beak. The shoot is then cut through a little lower down, and the parent weevil may be seen climbing upon it, when the operation is nearly completed, to make it fall by her weight, and returning again to her work, if it is not yet ready to fall. She lays about two eggs a day, but continues her operations for many weeks, so that much destruction is effected. The larva feeds on the pith of the fallen shoot, and deserts it when ready to become a chrysalis, to bury itself in the ground.—The larva of a large species of weevil (*calandra palmarum*) inhabits palm-trees in South America, feeding on their central part, and is eaten and esteemed as a delicacy. When roasted, it almost melts into grease; but its flavor is said to be remarkably fine. This weevil is black; about an inch and a half long; its larva is between two and three inches long. Another species (*calandra sacchari*) is very destructive to the sugar-cane. Its larva is also eaten in the West Indies and Guiana.—The wood of pines and firs is the food of certain kinds of weevil, so that plantations suffer severely from their ravages. Thousands of acres of pines in the southern states of America have been destroyed by a weevil (*hylobius pales*), not much more than a quarter of an inch in length; and some of its congeners in other countries are scarcely less destructive, as *hylobius abietis* in Europe. There are many species of weevil which attack leaf-buds and flower-buds. Thus *anthrenus pomorum* infests the apple-tree, depositing its eggs in the flower-beds, and cutting off the prospect of fruit. *Anthrenus pyri* is equally injurious to the buds of pear-trees. Some species of *rhynchites* lay their eggs in fruits—as apples and plums—at an early stage of their growth, cutting the fruit-stalk, so that the fruit may fall to the ground. The European nut-weevil (*balanus nucum*) lays its eggs in young hazel-nuts, upon which the larvæ feed as the nuts grow; a nearly allied species attacks, in like manner, the hazel-nuts of America, and another

infests acorns. The pea-weevil (q.v.) feeds upon peas; and other leguminous plants have their peculiar species, which devour their seeds. The corn-weevil (q.v.) is very destructive to wheat, and other similar species to maize, rice, and other kinds of grain.

WEFT, or **WOOF**, the thread which, in weaving, is passed by the shuttle backward and forward through the warp. See **WEAVING**.

WEGEFARTH, a co. in n.w. Texas, unorganized; comprising part of the "pan-handle" district; watered by branches of the Red river, and inhabited by Indians.

WEIGELA, a shrub brought from China, and named *Weigela rosea*, after Weigel, a German botanist. The correct botanical name is, however, *diervilla*, this generic name having the precedence, but the plant is commonly known by the name *weigela*. There are two native plants, known as bush honeysuckle. The northern species, *diervilla trifida*, is common in the middle and northern states, extending to Hudson's bay and to the Rocky mountains. It grows from 1 to 4 ft. high; leaves oblong-ovate and having petioles; pale yellow flowers, usually three on a stalk, from the axils of the upper leaves. The southern species, the *d. sessilifolia*, grows along the southern Alleghanies, and has sessile leaves.

WEIGHING-MACHINES are of various forms according to the quantity and species of the goods whose weight is to be determined. The great majority of weighing-machines are founded upon the principle of the lever (q.v.), the chief exceptions being the various forms of the spring-balance (q.v.), to which might be added (though in such cases the term "machine" is quite inapplicable) some of the methods employed to determine specific gravity, time of oscillation, etc. The simplest and primitive form of weighing-machine is the balance (q.v.) with equal arms, which can be adapted either to the maximum of accurate weighing or to the most rapid equiponderance. But as this machine necessitates the placing in one scale of weights equal to the weight of the goods, it was soon found to be more convenient to employ a lever with unequal arms—the goods to be placed in the scale attached to the short arm, and therefore equipoised by less weights, the ratio of the weights in the two scales being in proportion to the ratio of length of the arms. On this principle the *steelyard* (see **BALANCE**), the *bent lever balance* (see **BALANCE**), and the *cart steelyard* are constructed. But the convenience of equipoising a greater weight by one much less is counterbalanced by a considerable diminution in accuracy—one of the causes of error being the greater liability to flexure of the longer arm of the lever; and another, the necessity, for convenience' sake, of having the arm which is affected by the goods to be weighed as short as possible—the latter of itself reducing the accuracy of the steelyard to that of a symmetrical balance, whose arms are each equal to the short arm of the steelyard. However, on behalf of the steelyard, there is again the advantage of rapid equipoise. Each of these machines is variously constructed, the modifications having reference either to convenience of use, or to the species or weight of the goods to be weighed: an example of the former is the equal-armed balanced, made in an inverted manner, with the scales above, and the rods which connect the scales with the beam so united as to preserve their perpendicularity during oscillation; and the latter is appropriately illustrated by the form of cart-steelyard given in fig. 1. The dotted lines, DD, DD, indicate the grooved plates on which the wheels rest; E, E, E, E are the four points supporting the wheel-plates on the two triangular levers, CBB, CBB; the triangular levers are supported by the hooked extremities of their bases, B, B, B, B, upon fixed supports, A, A, A, A: while their vertices, C, C, are attached to a lever, FG, whose fulcrum is at F; G is attached by a chain to H, the extremity of a lever of the first kind, whose fixed support is at K., and on whose other

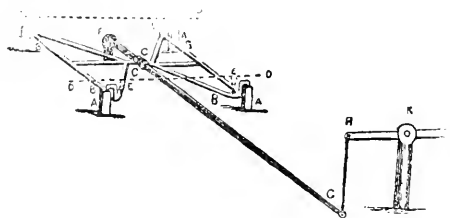


FIG. 1.

arm (graduated) the weight for equipoising the cart and its load are placed. The machine is thus seen to be compound, consisting of the two triangular lever pieces, of a simple lever of the second, and of one of the first kind; the weight L, if sufficient, raising H, and with it G, and thence raising C, and so balancing the downward pressure of the cart and its load at E, E, E, E. Various other forms of the cart-steelyard are in use. Mr. Duckham's weighing-machine is an ingenious adaptation of hydrostatics.

WEIGHTS AND MEASURES. For the proper carrying on of mercantile transactions, and for many other purposes, it is necessary that there be fixed and readily accessible standards of magnitude, of weight, and of value. The lengths implied by the names *a foot*, *a hand*, *a cubit*, *a fathom*, are far too indefinite to have long continued to satisfy the wants of civilized nations; and in every country, by common consent, or by the action of government, determinate measures have been agreed upon. These measures, left almost to chance, have been different from one nation to another, even from county to

county, sometimes from town to town, and still more awkwardly, often from one trade or guild to another.

Any one can appreciate the inconvenience of such a want of uniformity, for, in every transaction extending beyond his own sphere, he has to take account of the change of measure, the change of weight, the change of money, perhaps of all three at once. We all see and allow that there ought to be only one system of weights and measures in one country; that one bushel in Winchester, another in New York—one acre in England, another in Scotland, and a third in Ireland; that troy weights, avoirdupois weights, and all the other local, conventional, and trade variations which abound in the British dominions, form an aggregate of unbearable confusion, leading to endless mistakes and ceaseless quarrels. It is not more difficult to extend our observation, and perceive that if one system be advisable for one country, a universal cosmopolitan system would be no less advantageous for the whole world.

The only practical method of establishing a system of measures is to construct standards of reference, and to preserve these carefully in some public place. In order that these standards may not be worn and injured by too frequent use, it is convenient to have authenticated copies deposited in the various towns, so that all dealers and artificers may have ready access to them, and so that all makers of weights and measures may be without excuse for errors in their workmanship.

To set up a standard of measure seems to be a very simple matter—the authorities have only to fix upon the proper length of a yard, to have a piece of wood or of metal made to that length, and to cause it to be properly marked and preserved. For common purposes this seems to be quite enough: however, experience soon shows the inconvenience of this simple plan, for, by repeated contacts, the ends of the yard-measure get worn. Instead, therefore, of making a rod just a yard long, they make it a little longer, and upon it form two fine marks a yard distant from each other, and hold this distance to be the true standard. By this expedient the effects of wearing are got rid of; copy after copy can be compared with the original, without deterioration of the standard.

But use is not the only cause of deterioration: wood decays or is worm-eaten, and metals are liable to oxidation, so that the material has to be carefully chosen. This is not all. Every substance which has been examined is found to change its size with a change of temperature; the standard bar is shorter in winter than in summer, and the change, though it be so small as to be of no moment to the haberdasher, the wright, or the mason, is enough to cause great trouble to those engaged in very accurate work. Hence, in the selection of the substance to be used for the standard bar, we must have an eye to smallness of expansion as well as to durability. The substances available, taken in the order of their expansibility, are: *deal, glass, platinum, gold, silver, iron, brass, copper*. Deal may be put aside as wanting in durability, and the choice may be said to lie between glass and platinum, neither of which is much acted on by the air, or by the vapors which are found in the atmospheres of large towns. The fragility of glass and the costliness of platinum are objections; but the latter is a mere trifle when a national standard is concerned. Platinum, then, seems to be the best substance.

The standard measure for the British empire is a brass rod, into which two pins of gold are inserted; the upper surfaces of these are sunk to the half thickness of the bar, and a small dot is made in the middle of each. The distance between the centers of these dots, taken when the temperature is at 62 Fahr., is declared to be the true yard.

In the same way as the standard of measure so must the standard of weight be established. A piece of heavy metal is made of the desired weight, and is duly authenticated. The preservation of the standard of weight is a matter of very considerable difficulty. Every occasion on which it is used, each removal of dust from its surface, the actions of the oxygen of the air and of the products of combustion which are always floating about, produce a sure though slow waste; and all that can be done is to retard this waste as much as possible. Perhaps a lump of platinum would make the best standard; but its softness is a decided objection.

In the use of a standard of weight another matter has to be taken into consideration. The apparent weight of any substance is less than its true weight by the weight of as much air as is displaced by it. Now, the density of the air is not constant—air, when warmed, expands very much more than any solid body; and therefore a piece of metal appears to weigh more in warm than in cold weather. Not only so, air is rendered more dense by an increase of pressure, and so, when the barometer is high, all heavy bodies become apparently lighter; when the barometer sinks they appear to become heavier. Thus the apparent weight of the standard pound is continually changing. If we accurately adjust two weights of brass when the barometer is low and the air warm, and afterward compare them when the barometer is high and the weather cold, we can perceive no change, for, though each has lost weight, they have lost alike. But if we had adjusted a weight of iron to a weight of platinum in light air, and again compared them in dense air, the change would have been at once seen. For, since a pound of iron is more bulky than a pound of platinum it displaces more air, and its apparent weight undergoes a greater change than does that of the platinum. Fortunately, these changes are too small to have any perceptible influence on mercantile transactions, yet they are sufficient to create the necessity for it being enacted that the standard weight must be held as true when the air is in a specified state as to warmth and pressure. The stand-

ard brass pound, which serves for the British empire, is to be used when Fahrenheit's thermometer is at 62° , and the barometer is at 30 inches. (See note at the end.)

The thought naturally arises, what if, in the course of time, the original standards be lost or destroyed?

Time was when a seed of wheat gathered from a well-ripened ear served sufficiently well to define a grain weight; and even now the eastern jewelers weigh their gems against the *carat* or carob-bean, the hardness and uniformity of which seem to justify the selection of it. But for the extended purposes of modern commerce, and particularly for the more delicate requirements of scientific research, it is indispensable that we find some unchanging object of comparison; and none can be preferred to the earth itself as the most universally acceptable and as the best defined. For the purposes of geographers and navigators, the circumference of the earth is divided into degrees and minutes, the length of one minute being the geographical or nautical mile; and it certainly would have been convenient if the common or statute mile had agreed with this. The dimensions of the earth are now known with a precision far greater than is needed for ordinary purposes; the entire length of the circumference of a meridian circle being 131,236,000 of our standard feet, so that the length of a nautical mile is 6,075 ft. and about 9 in.; and it is highly probable that subsequent and more accurate measurements will not alter this determination more than an inch or two either way. It is usual to divide the minute into 60 seconds, so that a second of the earth's circumference is 101.25, and thus if our standard foot had happened to be one-eightieth part longer than it is, there would have been exactly 100 ft. in a second, and 6,000 ft. in a nautical mile. When we reflect on the disparity of the foot used by different nations, and recollect that 100 Vienna ft. make 103.6 English, as many Amsterdam feet 92.7, as many Berlin feet 99.2, we can hardly help regretting that our forefathers had not happened to hit upon the exact 100.

The ancient Greeks were fond of dividing into sixties; this division still continues in our scales for angles and for time; and it is worthy of remark, that if we divide the whole circumference of the earth into 60 parts, each of these into 60, and again each into 60, we arrive at a distance of 607.5 English feet. Now, the length of the ancient Greek stadium or furlong is stated to be $606\frac{1}{2}$ ft. by some writers; and if deduced from measures of the Roman mile, is between 605 and 613 ft.; so that if we desire a cosmopolitan standard, we can hardly do better than go back to the ancient Greek *stadium* or the Chinese *li*, corrected to suit the more accurate determination of modern times: this would bring us to the geographical foot, one-hundredth part of a second of the earth's meridian.

The standard of weight is readily connected with the standard of measure. Some substance which can be easily obtained pure is chosen, and a definite bulk of it is weighed. Distilled water is universally selected for this purpose; and in the British system the weight of one cubic inch of pure water is declared to be 252.458 grains when it is at the temperature of 62° Fahr.

It has long been known that water does not continue to contract as it is cooled; the contraction becomes less and less as the temperature approaches to 41° or 39° Fahr.; and the water, when cooled more, begins to expand, and continues to grow more bulky until it be on the point of freezing. On this account it has been proposed, and without any doubt it would be the best plan, to take water when at its greatest density as the standard for comparison, because then an error of a degree in temperature will produce no perceptible error in the weight.

The operation of verifying the standard of measure by comparing it with the size of the earth is necessarily an expensive and a complicated one, only to be attempted under the auspices of a wealthy government, or with the concurrence of several nations; and it is desirable to find out something more local and more easily obtained wherewith to compare our measures. The length of the pendulum (q.v.) has been proposed; and, on account of a very simple and beautiful property of pendulums, the comparison can be readily made. If we imagine an excessively minute heavy body to be suspended by a thread so fine that the weight of the thread may be neglected, the compound so formed is called a simple pendulum; and the question becomes, what must be the length of such a pendulum in order that it may vibrate from side to side in, say, one second of time? Now, it is clear that we cannot obtain this length by direct experiment, since we cannot construct such a pendulum. M. Biot tried to approximate to it by using a small ball of platinum hung by a very fine wire. However, it is known that if a heavy rigid mass be suspended by a knife-edge, and if its vibrations be made in the same time with those of a simple pendulum, then if we place another knife-edge at a distance from the first equal to the length of the pendulum and reverse the ends, the compound pendulum will again vibrate in the same time as before. Hence we have a very simple method of comparison. Having constructed a strong bar with two knife-edges at a known distance from each other, say at the distance of a yard, let us then, by many trials, filings, and scrapings, so adjust it as that the times of vibration shall be alike for the two knife-edges, and, finally, let us count how many vibrations such a pendulum makes per day, and then we shall have a means of verifying our measure.

The act of parliament which fixes our present weights and measures enacts that the length of a pendulum vibrating in one second of mean solar time is 39.13929 in.; now the lengths of pendulums are proportional, not to the times in which they vibrate, but

to the squares of those times; and so if we know the length of one pendulum, and the number of vibrations it makes per day, we can calculate what ought to be the length of another to vibrate a given number of times. A convertible pendulum having the distance between its knife-edges exactly 36 in. ought to make 90088.42 vibrations per day.

When only a degree of accuracy sufficient for commercial and ordinary purposes is aimed at, the above process is by no means difficult; but when extreme precision is wanted, the operation is attended with many and very great difficulties; it involves considerations which would hardly have been expected. In the first place, our experiments are made in air, and the buoyancy of the air lessens the actual weight of the pendulum; that buoyancy has to be allowed for, and therefore it is declared that the above length is that of a pendulum vibrating in a vacuum. Next, since the earth has a diurnal motion on its axis, every substance placed on it has a centrifugal tendency which goes to modify what otherwise would have been its gravitation; this centrifugal tendency produces the earth's oblateness, and causes a variation in the intensity of gravitation from one latitude to another. A stone is actually heavier in Edinburgh than it is in London. This change in gravitation cannot be measured by a balance, because the weights at each end of the balance are changed alike; but is seen at once in the going of a clock; for a pendulum regulated to go truly in London is found to go too fast when taken to a higher latitude, and to lose time when carried nearer to the equator. Hence, the enactment that the pendulum must be swung in the latitude of London. And again, the attraction which the earth exerts upon bodies placed near it diminishes with their distances, being inversely as the squares of the distances; hence, a clock carried from the bottom to the top of a hill loses time perceptibly, and so it is necessary to have the additional enactment that the pendulum be swung at the level of the sea.

In addition to these niceties, there are others connected with the manipulation, such as the parallelism of the knife-edges, their bluntness, the extent of the area of oscillation, and the stability of the supports, so that altogether the exact measurement of the length of the seconds pendulum is a matter of very great complexity. All these difficulties and troubles notwithstanding, we may hold that for all practical purposes, our system of weights and measures—and it may be added, the systems of all other civilized nations—is perfectly well established, whether it be regarded as derived from the dimensions of the earth, or from the intensity of gravitation.

No system of measures can ever claim to be of universal application from which geographical dimensions are excluded. It is essential that the unit of measure bear some simple relation to the earth's circumference, for otherwise the operations of the surveyor will not accord with those of the geographer. The only question, therefore, in regard to the establishment of a cosmopolitan system, is as to the number of parts into which the earth's circumference is to be divided. Now, the denary system of numeration has already asserted its supremacy; one by one the schemes followed by different nations have given way to it, and their very languages have been modified by its influence; sufficient traces remain to show how extensive these modifications must have been. The *three-score and ten* is not yet forgotten in English, nor the *quatre-vingt dix neuf* in French. In many trades the counting is still in dozens and grosses; yet our merchants count their interest, their discount, and their dividends in cents. The surveyor divides the foot on his leveling staff into tenths, hundredths, and thousandths; he makes his Gunter-chain of 100 links. The astronomer no longer divides the second into sixty thirds, but into hundredths; he gives his equinoctial time in decimal fractions of the day, and he makes the arguments for the planetary disturbances in thousandth parts of the whole revolution. There is no single instance in which the decimal system, once adopted, has been abandoned. See DECIMAL SYSTEM.

Note.—Since the above article was written, a new act, the weights and measures act, 1878, has been passed, which, while making no material change so far as mercantile matters are concerned, places the system on another and most unsatisfactory foundation. The standard of length is still the distance between the same two gold pins, but the standard of weight is now declared to be a platinum pound avoirdupois to be weighed *in vacuô*. The act contains no instructions as to how this is to be compared with any weight in air, nor does it narrate any connection between the brass weight of 5,760 grains in air, with the platinum one of 7,000 grains *in vacuô*. Further, the whole of the old act is repealed, so that there is now no connection between the standards of measure and of weight, nor between these and any natural or recognizable quantity. We are thus carried back to the rudest of all foundations, an arbitrary weight and an arbitrary measure. The fruits of laborious scientific research are put aside.

Weights and measures have, since 1824, been in great measure regulated by statute. The statute 5 Geo. IV, c. 74 was passed to enforce uniformity in the weights and measures used in various parts of Great Britain and Ireland; and a standard yard was defined as being then in custody of the clerk of the house of commons, and it was enacted that all superficial measures should be computed and ascertained by the said standard yard. The act also described how, if the said standard yard were to be lost or destroyed, another was to be made. So the statute defined a standard brass weight of one pound troy, and a standard gallon. That statute was altered by a subsequent statute of 5 and 6 Will. IV, c. 63, and inspectors were authorized to be appointed by justices of the peace, who had power to examine and stamp weights and measures

It was enacted that any contract, bargain, or sale made by any weights or measures unauthorized by the act should be wholly void, and every such weight might be seized by the inspector, and forfeited. One or two exceptions were made by the act—such as weights above 56 lbs.; wooden or wicker measures used in the sale of lime; glass and earthenware jugs or drinking-cups, though represented as containing the quantity of any imperial measure, or any multiple thereof, and these are not illegal, though incorrect. The act 41 and 42 Viet. c. 49, to consolidate the body of existing law on the subject, insists on uniformity in the use of imperial weights and measures, defines the standards of weight, length, and capacity as specified in the note to the preceding article, gives the penalties for unjust measures, regulates the stamping and verification of weights and measures, and prescribes how the law should be administered. See GRAM, LITER, METER, *ante*; METRIC SYSTEM.

WEI-MAR, a small but interesting t. of Germany, capital of the grand-duchy of Saxe-Weimar-Eisenach, and residence of the grand-duke, 60 m. s.w. of Leipsic by railway. It stands in a pleasant valley on the left bank of the Ilm; but the environs are in no way remarkable, and the town itself is irregularly and rather poorly built. Though the residence of the court, and finding its subsistence in providing for the wants of distinguished visitors, Weimar carries on neither trade nor manufactures, and seems a dull provincial-looking town. The luster conferred upon Weimar by the residence here, at the close of the 18th and the earlier portion of the 19th centuries, of Goethe (q.v.), Schiller (q.v.), Herder (q.v.), and Wieland (q.v.), at the court of Karl-August (see SAXE-WEIMAR-EISENACH), has faded since that group was broken up by death; and now the interest of the town is almost wholly derived from its monuments, traditions, and associations. The town church (*stadtkirche*), dating from the year 1400, has an altar-piece by Cranach, and contains a number of memorable tombs, among which are those of the brilliant soldier, Bernhard of Weimar (q.v.), and of Herder, the philosopher and critic. The ducal palace is a handsome building, some of the apartments of which are decorated by frescos illustrating the works of Goethe, Schiller, Herder and Wieland. The public library contains busts of these men of genius; and a number of relics, as the gown worn by Luther when a monk, and Gustavus Adolphus's leather belt, pierced by the bullet that caused his death at Lützen. The houses of Goethe, Schiller, and Herder are still pointed out. The two former of these poets lie interred in the grand-ducal burial-vault. The park and gardens of the palace, within which is the summer residence of Goethe, are much esteemed as a promenade. Pop. '75, 17,522.

WEIR, or **WEAR**—called also a dam, and in the n. of England and s. of Scotland a cauld—a structure placed across a river or stream for the purpose either of diverting the water into a mill-lade, of raising the level of the surface of the river and thereby increasing its depth for the purpose of navigation, or of providing the means of catching salmon and other fish. There is also the waste-weir, for the purpose of preventing a reservoir embankment being overtopped by floods; and the gauge-weir, for the purpose of computing the quantity of water flowing over it, from a measurement of the difference of level between the crest of the weir and the surface of the still water above it. The word is also sometimes used, though perhaps not quite correctly, to denote a training-wall or other structure parallel with the general line of a river, for the purpose of remedying or preventing loops or sinuosities. A weir may—according to the purpose for which it is intended, to the nature of the materials at command, or to other circumstances—be formed either of stone, timber, or brushwood, or a combination of any two. It is generally placed obliquely across the stream, in order to make the length of its crest considerably greater than the width of the channel, and thereby prevent the water in floods from rising to so great a height as it would do with a shorter crest, to the risk of damaging the adjoining low lands, and probably putting the mills above in backwater. In such cases the mill intake or the navigation lock, as the case may be, is generally placed at the down-stream end of the weir. Much obliquity, however, makes the current to impinge against and cut into the side of the river opposite the lower face of the weir, and to prevent that effect weirs are sometimes made of the shape of two sides of a triangle, or rather of that of an hyperbola, with its apex pointing up stream, which arrangement is peculiarly applicable to the case of there being an intake for a mill on each side of the river, and the apex is a very suitable place for a fish-pass or ladder. Not unfrequently, when at a wide part of the river, the weir is placed at right angles across, and with a slight curve upward; and a natural shelf of rock is often very advantageously made use of for either a mill or fishing weir, the low parts being made up where necessary with stone or timber.

The down-stream face of a weir is generally a pretty flat slope of stone "pitched" or set on edge, and with its toe, or lower edge, either sunk into rock, or protected from being underwashed by a row of timber-sheeting piles, and frequently also by an apron of timber-planking. The slope is either straight, or made with a hollow curve, so as to check the tendency of the water to acquire increasing velocity as it descends; and it is frequently divided into panels by timber-framing, so as, in the event of a portion of the pitching being washed out, to lessen the risk of the whole of it being carried away. The up-stream face is generally a slope dipping into the water, and protected by stone pitching, but it is sometimes a perpendicular wall. In order to render an ordinary sloping

weir water-tight, sometimes there is under the crest or coping a row of well-jointed and close-driven timber sheeting piles; but those being liable to decay, without their decay being visible, a better, though a more difficult and expensive arrangement, is to build a perpendicular wall of water-tight masonry under the crest. In either case, generally there is the additional precaution taken of having a wall of pounded clay on the upstream side of the wooden or stone barrier; and sometimes a mere wall of pounded clay alone, in the center of the weir, is trusted to, as the sole means of making it water-tight; but the latter is not a satisfactory arrangement, unless the stone-work next to the clay be so closely compacted by an admixture of gravel and sand as to prevent any current of water from reaching the clay and cutting into it. The down-stream face is sometimes made a nearly perpendicular wall, which, unless for the obstacle which it presents to the ascent of the salmon, is a very good arrangement, where the bottom of the channel is solid rock, so as not to be liable to be scooped out by the falling water; else it must have at its foot a level apron of heavy masonry for the water to fall on. The down-stream face is also sometimes made of a series of steps, so forming a succession of levels and light falls which is a very good plan for breaking the force of the falling water; but it, like the perpendicular face, presents obstacles to the ascent of the salmon, unless a fish-pass or ladder be provided.

The weir for the purpose of navigation need not be in any way different from the mill-weir, otherwise than that, instead of an intake sluice, there must be a lock (q.v.) with upper and lower gates, and a chamber between them as long and as wide as the largest vessels navigating the river. Fishing-weirs are generally provided with a sort of cage, called in Scotland a cruive, a word which has been made English by having been used in English fishing acts. The cruive consists of a chamber generally about 4 or 5 ft. in width, and as much or a little more in length, having at the upper end a portcullis grating, called the heck, with the bars vertical and 3 in. apart, so as to let small fish get through, and at the lower end two folding horizontally sparred doors called the inscales, pointing upward, but set so as to leave a small opening between the points, through which the ascending salmon enter. Partly from the inward pointing of the inscales, and partly from the instinct of the fish to ascend the river, they seldom get out again, and are easily caught. Frequently, weirs serve the purpose both of mill-dams and of fishing-weirs.

A weir sometimes made use of for catching salmon and other fish in tidal rivers, consists of a sort of horse-shoe shaped structure of loose stone-work, through which the water can percolate freely, with its heel or open end pointing up-stream. The fish ascend the river with the flood-tide, and falling back with the ebb, part get embayed within the walls at low water, and are either left dry, or are shut in so as to be easily caught.

Weirs, either of stone or of wicker work, are also sometimes made use of as an accessory to what in English fishing-rivers are called putts and putchers, being a sort of combination of wooden gratings acting something like those of the cruive and net-work; and in many cases, weirs, either natural, as formed by rocks or islands, or strictly artificial, are used for catching fish by means of an attached poke-net extended by the current.

By the English common law, no fishing mill-dam or fishing weir is legal except it be ancient, and even an ancient fishing-weir must have a free gap, and every fishing mill-dam must have a proper fish-pass.

The following are provisions as to weirs in the English salmon fishery act, 1861: For the purpose of clearly indicating the rights of mill-owners, etc., in the first place, the expression "dam" is defined to mean all weirs and other fixed obstructions used for damming up water; "fishing-weir," a dam used for the exclusive purpose of facilitating the catching of fish; and "fishing mill-dam," a dam used partly for facilitating the catching of fish, and partly for supplying water for milling, etc. (24 and 25 Vict. c. 109, s. 4).

The following regulations are to be observed with respect to dams: No dam, except such fishing weirs and fishing mill-dams as were lawfully in use on Aug. 6, 1861, by grant, charter, or immemorial usage, must be used for facilitating the catching of salmon. Any proprietor of a fishery, with the consent of the home office, may attach to every dam which existed on Aug. 6, 1861, such a fish-pass as the home office may approve, so that no injury be done to the milling power, or to the supply of water to or of any navigable river, canal, or other inland navigation. Every person who, in waters where salmon are found, constructs a new dam, or raises or alters, so as to create increased obstruction to fish, a dam already constructed, must attach and maintain in an efficient state such a fish-pass as may be determined by the home office. By the Tweed act, mill-dams, weirs, cauls, and other permanent obstructions are to be so constructed as to permit the free run of salmon in the ordinary state of the river. In Ireland, as in England, weirs are legal, if they can be traced back to statute 25 Edward III. Special fishery commissioners have power to inquire into legality of all fishing weirs, and every fishing weir must have a free gap.

By the old Scotch law, a provision as to mill-dams is given in the act 1696, as follows: "In respect that the salmon-fishing within the kingdom is much prejudiced by the height of mill-dams that are carried through the rivers where salmon are taken, his

majesty, with consent of the estates of parliament, orders a constant slope in the mid-stream of each mill-dam dyke; and if the dyke be settled in several grains of the river, that there be a slope in each grain (except in such rivers where cruives are settled), and that the said slope be as big as conveniently can be allowed, providing always the said slope prejudice not the going of the mills situate upon any such rivers." Cruives are by various old acts declared to be illegal in *tidal* waters, except the cruives and yairs of the Solway, which is exempted as being a border river.

By the Scotch fishery act of 1862, the commissioners are empowered "to make general regulations with respect to the construction and alterations of mill-dams, or lades, or water-wheels, so as to allow a reasonable means for the passage of salmon;" and they made a by-law, which has been sanctioned by the home secretary, providing that every dam should have a salmon pass or ladder, and also making provision for hecks at the intakes and lower ends of the mill-lades, and immediately above the wheels, and regulations whereby the water, when not used for the mills, should be sent down the natural channel of the river. The commissioners are also required to make, and have made, general regulations as to the construction and use of cruives, which implies their legality, but only where there is a prescriptive right.

WEIR, ROBERT WALTER, b. N. Y., 1803; studied art in Italy, and returned to this country in 1827. He was for four years, 1830-34, professor of perspective in the national academy of design, and in 1834 became instructor in drawing at West Point, where he has held a professorship since 1846. His best pictures are: "Embarkation of the Pilgrims" (now in the capitol rotunda at Washington), "View of the Hudson from West Point," "Indian Captives," "Landing of Hendrick Hudson," and "Columbus before the Council of Salamanca." JOHN F., his son, is also a painter of some note, and is professor of painting and design at the Yale school of fine arts.

WEISBACH, JULIUS, 1806-71; b. Germany; educated at Freiberg, Göttingen, and Vienna. In 1833 he was called to the chair of applied mathematics in the Freiberg academy. His principal work is *Lehrbuch der Ingenieur-und-Maschinenmechanik*, 3 vols. (1845-54), which has been translated into English. Some of his discoveries are of great value to the science of hydraulics.

WEISHAUP, ADAM. See ILLUMINATI, *ante*.

WEISS, JOHN, 1818-79; b. Boston; educated at Harvard college and divinity school. He was settled over a Unitarian church in Watertown in 1843, and again, 1859-70; when he left the pulpit, and began to give his entire attention to literature. He was an active abolitionist, his pronounced views on slavery leading to his withdrawal from his Watertown church in 1847. He was an adherent of the transcendental philosophy, and an advocate of woman's rights. In religion he was a rationalist. Among his works are *Life and Correspondence of Theodore Parker* (1864); *American Religion* (1871); and *Wit, Humor and Shakespeare* (1878).

WEISSENFELS, a t. of Prussia, in the government of Merseburg, and 12 m. s. of the town of that name, on the Saale. Pop. '75, 16,956, employed in the porcelain-factory and in wool-spinning, shoemaking, the manufacture of piano-fortes, tanning, and a trade in timber. The castle, once the residence of the dukes of Weissenfels, is now a barrack.

WEITZEL, GODFREY, b. Ohio, 1835; graduated at West Point in 1855, and was appointed to the engineers. He was at first employed on the fortifications of New Orleans, and was assistant professor of engineering at West Point for the two years preceding the war. In 1861, after taking part in the defense of fort Pickens, he became chief engineer of the department of the Ohio. The next year he was chief engineer of Butler's expedition to New Orleans, of which place, after its capture he was acting mayor. He was made brig. gen. late in 1862, commanded a division at the siege of Port Hudson in 1863, accompanied the expedition to Sabine pass, and in 1864 became chief engineer of the army of the James. The same year he went with Butler's expedition against fort Fisher. In Mar., 1865, he commanded the federal forces n. of the Appomattox, and soon afterward he entered Richmond. He left the volunteer service with the rank of maj. general.

WELBY, AMELIA B. (CORPUS), 1821-52; b. Ky.; married George B. Welby, a Louisville merchant in 1838. Her first poetical efforts appeared in the *Louisville Journal* over the signature of Amelia. Collections of her poems were published, 1844, 1850.

WELCH, MOSES COOK, D.D., 1754-1824; b. Conn.; graduated Yale college, 1772; taught school; studied law and theology; was in the army of the revolution; pastor at Mansfield, Conn., 1784-1824. He was the teacher of Eleazar Williams, sometimes called the dauphin of France.

WELCKER, FRIEDRICH GOTTLIEB, one of the most distinguished scholars of Germany, was b. in the year 1784 at Grünberg, in Hesse-Darmstadt; studied at Giessen; was appointed one of the masters of the gymnasium there in 1803; and in the year 1806, traveled to Rome, where he remained two years. Here he became acquainted with the celebrated Danish archaeologist, Zoega, whose life and essays he afterward published, and by whose example he was stimulated to that subtle appreciation of the works of ancient art which appears everywhere in his works. On his return from Italy, he was

appointed to a professorship of ancient literature, first in Giessen, then in Göttingen, and finally (1819) in the newly erected Prussian university of Bonn, which continued to be the scene of his scholarly activity till his death in 1868.

Welcker belonged to that class of scholars who, since Heyne and Wolf, have given such a lofty inspiration, such a philosophical significance, and such a historical comprehensiveness to those studies which, for want of a better name, we are forced still to designate philology. But philology in this country generally means the history and philosophy of language; with the Germans, as it did originally with the Alexandrian Greeks, it means, the sympathetic understanding and the imaginative reconstruction of the life and thought of famous ancient peoples, based on the critical treatment of ancient documents, or the tasteful appreciation of the monuments of ancient art. It is needless to say that this "philology" is a very different thing from the minute verbal and metrical preciseness which was long the leading characteristic of scholarship in this country. For however important these minutiae may be in their place, they are manifestly valuable only as means to an end; and even when the end has been steadily kept in view, it cannot be denied that some of our greatest intellects have spent more of their strength on these subsidiary matters than their importance deserves. In Welcker, Otfried Müller, and other German scholars of the first class, we see a general reaction against this narrow school; and a reaction which was sure to prosper, as it was based on thorough academic training, and had learned to neglect no trifle and despise no minute point which could be made subservient to higher purposes. If it was the fault of German scholarship generally that it was too professional and too academic, it is the praise of Müller, Welcker, and the school to which they belong that they have bridged over the gulf which separates learning from life, and inspired the dry bones of tradition with a spirit which makes them intelligible to the present, and significant of the future. The long academic career of Welcker was distinguished by an uninterrupted course of scholarly activity. Many of his works are tracts and essays on archaeological subjects without external unity, but all exhibiting a remarkable combination of extensive and accurate learning, fine taste, delicate sensibility, and sound judgment. We can only note here his three most important works of a larger compass. The first is the *Æschylean Trilogy* (1824), in which the organic connection and sequence of the Greek dramas are set forth with a richness of constructive detail not altogether free from that fanciful and problematic element which is one of the most distinguishing characteristics of German scholarship. The second is the *Epic Cycle* (1835-49), a work which has done great service to the right appreciation of early Greek literature, by taking Homer out of that region of mysterious isolation in which he had been previously allowed to remain. The third, and perhaps his greatest work is the *Götterlehre*, or Greek Mythology (1857-62), which embraces all that is good, and rejects all that is bad in the wide German literature of this subject, with a delicate tact and a just discrimination as valuable as they are rare. Of all Welcker's works, this is the one that would most probably bear with credit the ordeal of an English translation.

WELD, a co. in n.e. Colorado, bounded by the territorial lines of Wyoming and Nebraska; drained by the South Platte river and its affluents; 11,000 sq.m.; pop. '80, 5,646—728 of American birth, 15 colored. Co. seat, Greeley.

WELD, or WOOLD, also called DYER'S ROCKET, DYER'S WEED, and YELLOW WEED (*reseda luteola*), is a plant of the same genus with MIGNONETTE (q.v.), a native of waste places in England, very common in Germany and in many parts of Europe. It has an upright stem; 2 to 3 ft. high; lanceolate, undivided leaves; and long racemes of small yellow flowers, with 4-partite calyx and prominent stamens. It is used for dyeing. In order that it may yield a good dye, it requires to be cultivated with care. The best is grown in France, England, and Holland; and that produced about Cotte, in France, is preferred to all other. Good weld must have flowers of a beautiful yellow or greenish color, and abound in leaves; that which is small, thin-stemmed, and yellow, is better than that which is large, thick-stemmed, and green; that which grows on dry sandy soils is better than that produced on rich and moist soils. It was formerly cultivated to a much greater extent in Britain than it is at present, and was also more used by dyers than it now is. Weld is still, however, a valuable dye-stuff. It serves equally for linen, woolen, and silk, dyeing not only a rich yellow, but, with proper management, all shades of yellow, and producing a bright and beautiful color. Stuffs previously dyed blue are, by means of weld, changed to a very pleasing green. Large quantities of weld are imported from France.

WELD, ANGELINE EMILY (GRIMKE). See GRIMKE, ANGELINA.

WELD, THEODORE DWIGHT, b. Conn., 1803; entered Hamilton college, but did not graduate. He also entered Lane theological seminary, but withdrew to Oberlin, as did all the students except six, on the suppression by the trustees of the anti-slavery society in the former seminary. He lectured on abolition till 1836, when, having lost his voice, he became editor of some of the publications of the American anti-slavery society. In 1854 he organized a school in New Jersey; ten years later he settled in Massachusetts, where he still (1881) resides. Besides many pamphlets for the anti-slavery society, he has written *The Bible Against Slavery*, and *American Slavery as it is*.

WELDE, THOMAS, 1590-1662; b. England; graduated Cambridge, 1613; minister at Farling, Essex; came to America, 1632; was the first pastor of the church at Roxbury; opposed the religious views of Anne Hutchinson at her trial, 1637; aided Eliot and Mather in the preparation of the *Bay Psalm Book*; went to England with Hugh Peters as agent for the colony, but did not return; was pastor of a church at Gateshead, but ejected for non-conformity, 1662. He published *A Short Story of the Rise, Reign, and Ruin of the Antinomians, Familists, and Libertines that infested the Churches of New England*.

WELDING, the process by which some substances are united together in a softened state. It is generally applied to such metals as malleable iron, two pieces of which, heated to redness, may be made to unite by applying them together and beating with a hammer. Other substances, such as horn and tortoise-shell, can be welded by first making separate pieces soft by heat and pressing them together, which causes so intimate a union that no traces of the junction remain after cooling.

WELLAND, a co in s. Ontario, dominion of Canada, having the Niagara river for its e. boundary and lake Erie on the s.; 395 sq.m.; pop. '71, 25,760. It is drained by the Welland river, and intersected by the Welland canal. Co. seat, Welland.

WELLES, EDWARD R., D.D., b. N. Y., 1834; graduated Hobart college; ordained in the Protestant Episcopal church, 1857; minister of a church at Red Wing, Minn.; prominent in general convention; consecrated bishop of Wisconsin, 1874.

WELLES, GIDEON, 1802-78; b. Conn.; educated at Norwich university, and called to the bar. He was originally a democrat; was editor of the *Hartford Times*, 1826-37; and an adherent of gen. Jackson. He served in the legislature, 1827-35, was postmaster of Hartford during Van Buren's administration, and comptroller of the state, 1842-46. He joined the republican party upon its foundation; was the head of the Connecticut delegation to the republican national convention in 1860, and was secretary of the navy, 1861-69.

WELLESLEY, a province on the w. coast of the Malay peninsula, opposite the island of Penang; bounded n. by Quedah, e. by Siam, w. by the strait of Malacca. Several native states on the s. lie between it and the British province of Malacca. The province is 35 m. long and 4 wide; pop. '71, 71,433, mostly Malays. It is under the lieutenant-governor of Penang, and is one of the Straits Settlements. Surface undulating; soil very fertile; climate hot. A large part of the province is cultivated, chiefly by Europeans and Chinese, who raise rice, sugar, and tapioea. Good roads have been made by the English into the interior, which is reached also by the Perak and other rivers. The province was settled by a British colony in 1800.

WELLESLEY, RICHARD COLLEY WELLESLEY, Marquis, K.G., English statesman, was b. at the town residence of his family, Grafton street, Dublin, June 20, 1766. The family of Wellesley was one of Saxon origin, belonging to the county of Sussex, and was among the most ancient in Ireland, one of them having gone from England as standard-bearer to Henry II., who gave him large grants of land in Meath and Kildare. William de Wellesley was in 1334 summoned to parliament as baron Noragh, and was high in favor with Edwards II. and III. The name (originally *Wesley* or *Wesleey*) was written Wellesley till the 16th c., when it became abbreviated into Wesley. Mr. Garrett Wesley of Dangan, county Meath, married Miss Colley of castle Garbery; and on the decease of his son without issue the estates were bequeathed to his cousin, Richard Colley, who thereupon assumed the name of Wesley. The Colleys, originally Coweys, were also of an ancient descent, and came originally from Rutlandshire. Richard Colley, who thus succeeded to the Wellesley estates, though in no way related by blood to the earlier Wellesley family, was created baron Mornington. His eldest son received (1769) the dignities of viscount Wellesley and earl of Mornington, and enjoyed the still more enviable distinction of being the father of the marquis Wellesley, the subject of this notice, and of Arthur, first duke of Wellington, by his marriage with the eldest daughter of Arthur, first viscount Dungannon. Wellesley's father, the first earl of Mornington, although chiefly known for his talents as a musical composer, was a man of great abilities. Wellesley received his education at Eton, and afterward at Christchurch, Oxford, at both which seats of learning his fame stood high. An eloquent speech was made by him at Eton as early as 1778; and in 1780 he gained the university prize for the best composition in Latin verse, in which he excelled through life. His father having died in 1781, Wellesley, on attaining his majority, took his seat in the Irish house of peers, took upon himself the pecuniary obligations of his father, and placed the estates under the management of his mother, who survived her husband for nearly half a century. The debts of the first earl were liquidated, but Wellesley was unable to preserve the family possessions. He was one of the original knights of St. Patrick when the order was founded by George III. in 1783. It appears, from a correspondence between Pitt and the duke of Rutland, that at the age of 24 he had convinced both statesmen that he was destined to distinguish himself, and to render the public essential service. Dissatisfied with the limited field of distinction which Ireland afforded him, he obtained in 1784 a seat in the British house of commons as member for Beccalston. In 1786 he became

one of the lords of the treasury, when he was elected for Saltash. Being unseated on petition, he obtained a seat for Windsor, and became a favorite of George III. Accident directed his attention to India, and in 1795 he became one of the unpaid members of the board of control. In Oct., 1797, he received a seat in the house of lords as baron Wellesley; and, at a most eventful period, was selected to go to India as governor-general. Four powers then divided the sovereignty of India—the British; Tippoo Sahib; the nizam; and the Mahrattas, comprehending Scindiah, Holkar, and the rajah of Berar; and the w. of India was the scene of invasion by Zemaum Shah. Tippoo hated the English, and meditated their expulsion from India; and the troops in the service of the Nizam and the Mahrattas were officered by Frenchmen. When Wellesley arrived at Calcutta, in May, 1798, Egypt had been conquered by Bonaparte; and the native powers of India, incited by the French, were unfriendly to British rule. His first operation was one of great boldness. Disregarding the remonstrances of the Madras council, he ordered the nizam to disband 14,000 men, surrounded them with a British force, secured the 124 Frenchmen by whom they were officered, and sent them instantly to Europe. Having annihilated French influence, he began the reduction of the empire of Mysore. On Feb. 3, 1799, he ordered gen. (afterward lord) Harris to march with an army of 20,000 men direct from the coast upon the Mysore capital. He himself removed to Madras, to be near the scene of this eventful operation. In one short month the fortress of Seringapatam was taken, Tippoo Sahib slain and his dominions partitioned. Having thus in fifteen months destroyed French influence, struck terror into the native princes, and overthrown the most inveterate enemy of British rule in India, he returned to Bengal. Up to this period he had been the earl of Mornington; he was now (Dec., 1799) created by the king marquis of Wellesley, and received the thanks of parliament. The East India company offered him £100,000 of the prize-money realized at Seringapatam, but he refused, disdaining to be enriched out of military spoil. He afterward accepted an annuity of £5,000 voted him by the court of proprietors. His next step was to place the territories of the nabob of the Carnatic under the administration of the company, in consequence of the treachery of that prince. He also concluded a treaty with Persia, to which he attributed "the fall of Zemaum Shah, the confusion of the Afghan government, and the repression of the annual project of invading Hindustan from Cabul"—then, as since, the nightmare of Indian statesmen. In 1801 he sent a force of 7,000 men up the Red sea to assist in wresting Egypt from the French. The expedition, under gen. Baird, reached Egypt, and effected a junction with the army from England; but the French had already surrendered. In 1802, in consequence of differences with the court of directors, he tendered his resignation; but was induced to continue in office until January, 1806. The Mahratta war broke out; the battles of Laswaree, Assaye, Argaum, and Delhi were fought; and Scindiah, the Berar rajah, and Holkar were stripped of their dangerous influence and reduced to submission. A large accession of territory rewarded the gallantry of the army, and in 1805 Wellesley returned to England, after the most brilliant administration ever known in India. He had outshone even the native princes in the pomp and splendor of his progresses. He built the palace of Calcutta; founded and patronized the college of Indian literature; stimulated every attempt of natives and Europeans to bring to light the vegetable, mineral, and physical treasures of the "golden peninsula;" and inaugurated those important financial reforms which in a brief period raised the revenue of the company from 7 to more than 15 millions sterling. On his return he was received with every mark of respect and approval by the directors; but as matter of course there were many complaints that his administration had been oppressive, especially toward the native powers; and articles of impeachment were even presented to the house of commons, though they were rejected with contempt. He now prepared to enter anew upon a parliamentary career. George III. wished him to be one of the secretaries of state in the Portland cabinet, but he declined the offer. He went to Spain as ambassador-extraordinary in 1809; landed at Cadiz on the day the battle of Talavera was fought, and on Nov. 2 met his brother, the duke of Wellington, at Seville. In Dec., 1809, he was appointed secretary of state for foreign affairs; and in 1810 was elected a knight of the garter. He was favorable, both in and out of office, to the repeal of the penal laws affecting the Roman Catholics; and when, in Jan., 1812, the prince regent refused to agree to a concession of Roman Catholic claims, Wellesley resigned his seat in the cabinet. During the first ten years of the administration of lord Liverpool he remained in opposition. He protested against the insufficiency of the means placed at the disposal of the duke of Wellington, and did not cease to demand that he should be assisted to the utmost extent of the national credit and resources, until the duke had crossed the Pyrenees at the head of his victorious army, and brought the war to an end before Toulouse. When the settlement of the affairs of Europe was being arranged in 1815, Wellesley protested against the neglect of commercial interests, but without effect. He now began to ally himself with the more liberal section of the conservatives, who looked up to Mr. Canning as their leader, and accepted the office of lord-lieutenant of Ireland. Conciliation was to be the principle of his government, but he held office for 5 years without effecting any material amelioration, owing to the difficulties arising out of the state of the penal laws. He was recalled from Ireland by his brother when he took office in 1828. In 1830 Wellesley accepted the post of lord-steward of the household from earl Grey; and in 1833, in the

seventy-fourth year of his age, he again proceeded to Ireland as viceroy, where he remained until Sir R. Peel's administration of 1834. In 1835, on the restoration of the whig party, he accepted the post of lord-chamberlain, which he only held for a few months. In 1837 it became known to the directors of the East India company that he was in straitened circumstances and deriving little, if any, advantage from their annuity of £5,000 per annum; they therefore resolved that a sum of £20,000 should be vested in trustees for his benefit. In 1841 it was further resolved that his statue should be erected in the court room, as a mark of the admiration and gratitude of the East India company. He died at Kingston house, Knightsbridge, on Sept. 25, 1842, and, in compliance with his will, was buried in the vault at Eton college chapel. An authentic record of his Indian administration was undertaken by Mr. Montgomery Martin, under the direction and at the expense of the East India company, and published, in 1836, in 5 vols. 8vo, entitled, *Dispatches, Minutes, and Correspondence of the Marquis Wellesley, during his Administration in India*. A thin 8vo vol., issued in 1838, contains *Dispatches and Correspondence of the Marquis Wellesley during his Mission to Spain*. The marquis published several pamphlets on various occasions: *Substance of a Speech in the House of Commons on the Address in 1794*; *Notes Relative to the Peace Concluded with the Mahorathas*; *Letters to the Government of Fort George Relative to the New Form of Government established there*; *Letters to the Directors of the East India Company on the India Trade*; etc. He was twice married, but left no issue, and the marquise became extinct at his death; the earldom, etc., went to his next brother, but afterward reverted to the second duke of Wellington, as son of the great duke, who was third brother.

WELLESLEY COLLEGE, situated near the t. of Newton, 15 m. w. of Boston, on the Boston and Albany railroad, was founded by Henry F. Durant, formerly a lawyer of Boston, and his wife. Its object is to provide a course of study for young women, on a level with that of colleges for young men, though the curriculum may differ. The principal building stands on elevated land in grounds 300 acres in extent, formerly in great part a country-seat. It is in the form of a double Latin cross, 475 ft. long and 150 ft. wide in its greatest dimensions, and of the renaissance order of architecture. A new building, the gift of Mrs. Valeria G. Stone, has recently been erected at a cost of \$100,000, for the use of the teachers' collegiate department. The board of trustees, of which pres. Porter of Yale is president, and chancellor Howard Crosby of the university of the city of New York, vice-president, is a perpetual legal corporation. In the course of study prominence is given to modern languages, music, and art; Greek is elective. There are special courses for honors in classics, mathematics, science, and modern languages. A special feature of the library is the "Gertrude" collection of 1000 commentaries and aids to biblical study. In the year 1879-80 there were 34 members of the faculty, of which Miss Ada L. Howard is president, and the total number of students was 375.

WELLING, JAMES C., b. N. J., 1825; graduated at Princeton, 1844; in 1848 became the New York correspondent of the *National Intelligencer* of Washington, with which he was connected as associate and principal editor until 1866. From 1867 to 1870 he was principal of St. John's college, Annapolis; for a short time professor of belles-lettres at Princeton, and in 1871 was made president of Columbia university, D. C.

WELLINGBOROUGH, so called from the medicinal springs in its vicinity, is a market-town in the co. of Northampton, 10½ m. e.n.e. of the town of that name. It carries on a considerable trade in corn, boots, and shoes. Pop. '71, 9,385.

WELLINGTON, a co. in central Ontario, dominion of Canada, drained by the Grand river; 1278 sq.m.; pop. '71, 63,289. Co. seat, Guelph.

WELLINGTON, a small market-t. in the co. of Somerset, 7 m. s.w. of Taunton, at the foot of the Blackdowns, which are crowned by a monument commemorative of the battle of Waterloo. The town gives title to the duke of Wellington. Blankets, serges, and other woollen goods and earthenware are manufactured. Pop. '71, 5,119.

WELLINGTON, a small market-t. of Shropshire, 10 m. e. of Shrewsbury, at the foot of the Wrekin, on the Shrewsbury and Shropshire canal. The town forms the junction of several railways. It is situated in a populous mining and agricultural district, with coal and iron mines, iron works, limestone quarries, and wire-mills in the vicinity; while, in the town, there are smelting-furnaces, nail-works, and malt-kilns. The spacious public market, with town-house and assembly-room, cost about £20,000. Pop. '71, 5,927.

WELLINGTON, a t. of New Zealand, the chief town of a "provincial district," and since 1865 also the capital of the whole colony, the residence of the governor, and place of meeting of the "general assembly," or colonial parliament. Wellington was the first settlement of the New Zealand company, and was planted under the direction of col. Wakefield, with a band of pioneer colonists, in 1840. The town is beautifully situated on a bay of port Nicholson, itself an inlet of Cook's strait, on the southern coast of the North Island. The surrounding country is richly wooded, but the dense forests have begun to yield to the axe of the settler. The harbor is a fine expanse of water, 6 m. long and 5 broad, and has an excellent wharf, affording accommodation to ships of any tonnage, and considered one of the best in the Australian colonies. Since the removal of the seat of government hither, the town has made very rapid progress; it possesses a

number of good public buildings; a handsome pile has recently been erected for the use of the house of representatives and legislative council. The streets are generally spacious, and have good dwelling-houses. Wellington possesses a cathedral, together with 14 other places of worship, in connection with the Episcopalians, Presbyterians, Methodists, Roman Catholics, and Jews. There are also several banks and numerous insurance agencies. Two papers are published daily and one weekly. In June, 1866, a regular line of steam-packets was established between Sydney, Wellington, and Panama. Wellington is also connected by steamers with all the principal ports of New Zealand. Pop. 74, 10,547.

WELLINGTON, ARTHUR WELLESLEY, DUKE OF, K.G., one of England's greatest generals, was the third son of Garrett, first earl of Mornington, and brother of the marquis Wellesley (q.v.). He was born May 1, 1769, at Dangan castle, Ireland, and completed his military education, a few years before the French revolution, in the military college of Angers, in France. He entered the army as ensign in the 41st regiment in 1787, and became lieutenant of the 33d in 1793. In 1794 he embarked in command of the 33d regiment to join the duke of York's army in the Netherlands. In this, his first term of actual service, he commanded 3 battalions on the retreat of the army through Holland, and distinguished himself in several repulses of the French. In 1796 he accompanied his regiment to India, where his brother, the marquis Wellesley, shortly afterward arrived as governor-general. He commanded the subsidiary force of the Nizam, when the reduction of the Mysore was decided upon, and his division defeated Tippoo Sultan's right flank at Mallavelly. At the assault and capture of Seringapatam, he commanded the reserve in the trenches. He was appointed to the command in Mysore, and took the field (1800) against Dhondiah Waugh, a Mahratta freebooter, who was defeated and slain. He was named second in command of the expedition which sailed from India to assist the English army in Egypt, but was prevented from embarking by illness. It was in the Mahratta war of 1803 that the young general won his first fame. After besieging and capturing Ahmednuggur, Wellington, with only 4,500 men, came upon the combined Mahratta forces, 40,000 or 50,000 strong, and not waiting for a larger British force that was on its way, won the brilliant victory of Assaye (q.v.). The victory of Argaum followed, and the great fort of Gawulghur, supposed to be impregnable, having been taken in December, the Mahratta chiefs sued for peace, after one of the most extraordinary campaigns on record. Wellington was made K.C.B. and received the thanks of the king and parliament. In 1805 he returned to England, and in November commanded a brigade in lord Cathcart's expedition to Hanover. In 1806 he obtained a seat in the house of commons for Newport, Isle of Wight, and in April, 1807, was appointed chief-secretary to Ireland, the duke of Richmond being lord-lieutenant. He held a command in the army under lord Cathcart in the expedition against Copenhagen in 1807, and after the affair at Kioge, negotiated the capitulation of Copenhagen. He received the thanks of the house of commons in his place, and returned to Ireland. In 1808 he commanded an expedition which sailed from Cork, being the first division of the British army sent out to assist in the expulsion of the French from Spain and Portugal. He landed at Corunna, and offered his aid to the army and people of Galicia; but the offer being declined, he finally landed (Aug., 1808) with 10,000 troops at the mouth of the river Mondego, in Portugal. The whole of the n. of Portugal was then in arms against the French. The affairs of Obidos and Rolica were quickly followed by the battle of Vimieira, in which he defeated Junot, who lost 3,099 men and 13 pieces of cannon. After this event Wellington signed the armistice which led to the convention of Cintra (q.v.). He subsequently gave evidence generally in favor of this convention at the court of inquiry (Nov. 22). Being superseded in the command of the army by men who were only his superiors in military rank and seniority, he returned to England. For the battle of Vimieira, he again in his place, received the thanks of the house of commons. On the death of sir John Moore he returned to re-assume the command of the Peninsular army, previous to which he resigned the office of chief-secretary of Ireland. He arrived at Lisbon and assumed the command April 22, 1809. He had now to contend with Soult and Victor, who had entered Portugal at the head of a veteran army, and were in possession of its finest northern provinces. Oporto had been taken by Soult, and Wellington was anxious to bring him to action at once, in order that he might not make his retreat unharmed. The passage, at Villa Nova, of the Douro, a wide, deep, and rapid river, in the face of a formidable enemy, who had removed every boat and barge to the opposite side of the river, was one of the boldest and most successful operations of the war. Wellington entered Oporto the same day, and followed the French army. He was now, by a decree of the prince-regent of Portugal, marshal-gen. of the Portuguese army. The French had fallen back to a point where re-enforcements were to meet them; and on July 27 and 28, 1809, the enemy, commanded by Victor and Sebastiani, were defeated by the British under Wellington at Talavera. The slaughter on both sides was terrible in this desperate, almost hand-to-hand, conflict. Wellington was unable to follow up his victory owing to the non-co-operation of the Spanish army under Cuesta; and the want of supplies, and the junction of Soult, Ney, and Mortier in his rear, compelled him to fall back upon Badajoz. The thanks of parliament were voted for the victory of Talavera, and sir Arthur Wellesley was created (Sept. 4, 1809) a peer by the

titles of baron Douro of Wellesley and viscount Wellington of Talavera, with a pension of £2,000. In May, 1810, the French collected under Massena in such superior force in his front that he fell back upon Busaco, where he made a stand. Here the French (Sept. 27) made two attacks upon his position, but were repulsed with great slaughter. After this he retreated to Torres-Vedras (q. v.), to the occupation of which line of defense and his judicious method of maintaining it, the ultimate success of the Peninsular war may be chiefly attributed. Massena, being unable to find subsistence for his army, began his retreat to Santarem, followed by Wellington, who pursued the French in their retreat along the line of the Mondego. In April, 1811, he received the thanks of parliament for the liberation of Portugal. Spain, however, was now subdued by the French. The Spanish armies were annihilated, and it was of the last importance that Wellington should be able to keep his rear open to the Tagus. Wellington, having invested Almeida, Massena attempted to relieve it, but was skillfully repulsed at Fuentes de Onoro, May 3 and 5. The fall of Almeida followed, and Wellington ordered Badajoz to be invested. At this time he had great reason to complain of the want of support and re-enforcements from England. He had only the force which had followed Massena from Torres-Vedras, diminished by 9,000 men, *hors de combat*, in so many sanguinary encounters. Writing to marshal Beresford, he said: "I inclose a dispatch from lord Liverpool [then at the head of the home government]; I believe they have all gone mad." The siege was carried on with vigor; but learning that Soult and Marmont designed to join their armies into one, in order to relieve Badajoz, and his own inadequate force not justifying him in risking a battle, he raised the siege and retired to the frontiers of Portugal. He next laid siege to the strong fortress of Ciudad Rodrigo; and on the night of Jan. 19, 1812, it was carried by storm, and the garrison made prisoners. For this achievement he was created by the regency a grandee of Spain, with the title of duque de Ciudad Rodrigo. He again received the thanks of parliament and a further pension of £2,000 a year, and was advanced in the British peerage by the title of earl of Wellington. He next marched toward Badajoz, invested it in March, and carried it by storm, April 6, after a frightful carnage; the allies losing nearly 5,000 men. In June he advanced to Salamanca, captured the convents there, which had been fortified by the French, and drove Marmont to the Douro. On July 22 he gained at Salamanca one of his greatest military triumphs. Marmont extended his line, with the view of turning Wellington's right; but the latter, perceiving that the enemy had thus weakened their left and center, vigorously assailed the weak points, and, after an obstinate resistance, put the whole army to rout. Ammunition, stores, 2 eagles, 11 pieces of cannon, and 7,000 prisoners were the trophies of victory. The loss of the allies was only about 700 killed and 4,000 wounded. Marmont lost an arm, and four French generals were killed. Wellington received the order of the golden fleece, entered Madrid, was made generalissimo of the Spanish armies, and was advanced in the British peerage by the title of marquiss of Wellington. The thanks of parliament were again voted to him, together with the sum of £100,000, to be laid out in the purchase of lands to be settled on him, his heirs, and successors. In September he marched to Burgos, but, failing to capture it, he again retreated to the frontiers of Portugal. Wellington visited Cadiz and Lisbon, where he was received by the whole population. In May he marched his army into Spain in two columns, and on June 21 gained, at Victoria, another signal victory over the French, commanded by king Joseph, assisted by marshal Jourdan. The enemy lost 151 pieces of cannon and all their ammunition. The king's private carriage, letters, etc., fell into the hands of the victors. In exchange for the bâton of Jourdan, which was found on the field, the prince regent forwarded to Wellington the bâton of a field-marshal of England. By this splendid and important series of victories he had reached the summit of martial glory. The deliverance of Spain from the French was now certain. His infantry were soldiers who would, in his own words, "go anywhere and do anything;" and even the invasion of France itself seemed to his countrymen to be no longer chimerical. He pursued the French army to France by Pamplona. He failed, July 25, to carry San Sebastian by assault, but gained another decisive battle over Soult at the Pyrenees, and the French army retreated into France. A second attempt to carry San Sebastian by assault was successful, but it cost Wellington 2,300 in killed and wounded. He now crossed the Bidassoa, and invaded France. Pamplona surrendered. After the passage and battle of the Nivelle, and the passage of the Nive, the victorious army of Wellington was attacked, Dec. 10 to 18, on the left and right, by Soult, who was defeated. Leaving two divisions to blockade Bayonne, Wellington followed Soult with the rest of the army. On Feb. 27, 1814, he defeated Soult at Orthes, and crossed the Adour. The affairs of Aire and Tarbes were followed by the passage of the Garonne; and, on April 10, Wellington consummated this series of brilliant victories by again defeating Soult under the walls of Toulouse. The allied Russian and German armies having entered Paris, and Napoleon having signed his abdication a few days before, this last battle would not have been fought, but for the non-arrival of news of the events of Paris. In a few weeks Wellington was in Paris, presenting the trophies of his brilliant campaign to the allied monarchs. He was created, May 3, marquiss of Douro, and duke of Wellington in the British peerage, and received an additional grant of £400,000. He received for the twelfth time the thanks of parliament for his services, and on his arrival in England was greeted with the utmost enthusiasm. On June 28 he took his seat for the first time

in the house of lords. He next returned thanks at the bar of the house of commons, and was addressed by the speaker. He was appointed ambassador-extraordinary to the court of France in July, 1814, whence he proceeded to the congress of Vienna. Napoleon having escaped from Elba, the congress was abruptly broken up. Wellington was appointed commander of the British forces on the continent of Europe, and from Vienna joined the army at Brussels. It appeared probable that Napoleon would make a bold advance into Belgium, and its defense was assigned to an Anglo-allied army under Wellington, and a Prussian army under Blücher. The battles of Ligny (q.v.) and Quatre Bras (q.v.) were succeeded on June 18, 1815, by the great battle of Waterloo (q.v.). Here the grand and decisive blow was struck; here for the first and last time the emperor and the great English general met and measured swords, and here the power of Napoleon was finally crushed. The allied armies, under Wellington and Blücher, marched upon Paris; the French army evacuated Paris under a convention; and Louis XVIII. entered Paris the very day after the English army. Marshal Ney was brought to trial. He relied upon the terms of the capitulation of Paris, and appealed in vain to Wellington, who denied that the French king was bound by the convention—a reading which it is impossible to justify, as sir A. Alison has shown in his *History of Europe*. At the request of the allied sovereigns Wellington took the command of the army of occupation, and resided in Paris from 1815 to 1818. Two attempts were, during this period, made upon his life: gunpowder was placed in his cellar for explosion; and one Cantillon discharged a pistol into his carriage; for which attempt at assassination Napoleon I. left the mercant a bequest in his will. When the allied armies evacuated France in 1818 the emperors of Russia and Austria, and the king of Prussia, created Wellington a field-marshal of their armies. He was created prince of Waterloo by the king of the Netherlands. The gratitude of the British nation was, meanwhile, enthusiastically manifested. Statues were raised to his honor in the metropolis. Parliament voted £200,000 in addition to former grants; and the mansion and estate of Strathfieldsaye were purchased, to be held by Wellington and his heirs. The office of master-general of the ordnance, now abolished, but then comprehending the control of the artillery branch of the service, was conferred upon him. At the coronation of George IV., in 1821, he officiated as lord high constable of England. In October he attended George IV. to the field of Waterloo. In 1822 he represented Great Britain at the congress of Verona, where he ineffectually exerted his influence to prevent the invasion of Spain by a French army, in support of absolutist principles. In 1826 he went on a special embassy to St. Petersburg, when he induced the emperor Nicholas to act in common with England and other powers, as mediators in the quarrel between Turkey and Greece. On his return he was appointed constable of the tower. In 1827 he succeeded the duke of York as commander-in-chief of the army, and was made col. of the Grenadier guards.

From this period his political career may be said to begin. When Mr. Canning received the commands of George IV. to form an administration, Wellington, with six other members of the Liverpool administration (including lord Eldon and Peel), resigned office. In the explanation which he gave, he emphatically denied that he had entertained the ambition of himself filling the post of first-minister; and said he felt his incapacity for such an office so strongly that he should have been "mad" if he had coveted it. In Aug., 1827, after Mr. Canning's death, he again accepted the command of the army, which he resigned on being called upon by George IV. (Jan. 8, 1828), to form an administration. Of strong tory politics, he was, nevertheless, the first minister to cede to the growing popular power. The test and corporation acts were repealed, and the removal of the Catholic disabilities was the first measure proposed by Wellington in the following session, upon the ground of the formidable attitude of the people of Ireland and the danger of civil war. This measure involved him in a bloodless duel with the earl of Winchelsea. The French revolution of 1830 appears to have influenced him in making a firm stand against reform in parliament, in the same proportion that it raised the demands of the people; and when the struggle of continental Europe to emancipate itself from arbitrary government strengthened the popular cry for "parliamentary reform," he chose the earliest moment to declare the unalterable perfection of the representative system of the country, and the determination of his government to resist all measures of parliamentary reform. His unpopularity became excessive; and, anticipating a defeat in the house of commons, on Mr. Brougham's proposition for reform in parliament, Wellington resigned office, and was succeeded by earl Grey. He had meanwhile become lord-warden of the Cinque ports. Under the administration of earl Grey, Wellington held no office. He strenuously opposed the reform bill, and a London mob broke the windows of Apsley house, and hooted and pelted him in the streets. In Jan., 1834, he was elected chancellor of the university of Oxford. Upon the enforced resignation of lord Melbourne, in Nov., 1834, he was sent for by William IV. He declined to take the premiership, and was intrusted by the king with the whole charge of the government, and the seals of the three secretaries of state, until sir R. Peel could arrive from Rome. Peel constructed a conservative government, in which Wellington took the office of foreign secretary. In April Peel resigned, and henceforward Wellington ceased to take a prominent share in the civil government of the country. He gave a generous welcome to Soult, who represented France at the coronation of queen Victoria, and was received with great cordiality by the people on this occasion. In Aug., 1839, a grand

banquet was given to him at Dover, as lord-warden of the Cinque ports, on which occasion lord Brougham proposed his health in a brilliant eulogium. In 1841 he accepted a seat in the cabinet of sir R. Peel without office. In 1842 the queen visited him at Walmer castle, and in the same year he was re-appointed to the command of the forces. In 1845 he doubted the policy of repealing the corn laws; but in conformity with his usual practice of considering "how the queen's government was to be carried on," he determined to stand by sir R. Peel in his attempt to abolish them. Wellington not merely consented to remain in the cabinet, but accepted the higher office of president of the council in lieu of the post of lord privy seal. When the bill came up to the lords, Wellington, with great emotion and earnestness, warned the peers not to reject the bill, and never to separate themselves from both the crown and the house of commons. His speech made a great impression, and the bill passed a second reading by a considerable majority. He retired with the Peel government in July, 1846. After this event, he may be said to have withdrawn from political strife, nor is it to be denied that his share in the repeal of the corn laws cast a halo of popularity around the remainder of his life. In 1848 he called attention to the unsatisfactory state of the national defenses in a letter to sir J. Burgoyne. As commander-in-chief he directed great preparations to be made to prevent a Chartist outbreak on the 10th of April. His last speech in the house of lords was delivered in support of the militia bill, when he declared that England had been carrying on war in all parts of the world with an insufficient peace establishment. On Sept. 14, 1852, he was seized at Walmer castle with an epileptic fit, became speechless, and died the same afternoon. His remains were honored by a public funeral. The body, after lying in state at Chelsea hospital, was removed to the horse guards; and, on the morning of Nov. 18, was borne through the streets of London to St. Paul's cathedral, where it rests by the side of that of lord Nelson. The funeral pageant was witnessed by a countless multitude. His *dispatches*, published by col. Gurwood, in 12 vols., are the proudest monument of his glory; they exhibit him as a commander who overcame countless difficulties by honesty, sagacity, singleness and constancy of purpose, and devotion to duty. Throughout his long career he appears the same honorable and upright man, devoted to the service of his sovereign and country, and just and considerate to all those who served under him. As a general he was cautious, prudent, and careful of the lives of his men; but when safety lay in daring, as at the battle of Assaye (q. v.), he could be daring in the extreme. He enjoyed an iron constitution, and was not more remarkable for his personal intrepidity than for his moral courage. The union of these qualities obtained for him the appellation of the "iron duke," by which he was affectionately known in his later years. His parliamentary oratory was plain, and to the point. He spoke without fluency or art, yet his strong sense and practical sagacious judgment gave him great weight with his brother-peers. His tastes were aristocratic; and his aide-de-camp and favorite generals were almost all men of family and high connections. Altogether, he was the very type and model of an Englishman; and in the general order issued by the queen to the army he was characterized as "the greatest commander whom England ever saw." He married, in 1806, the second daughter of the third earl of Longford, and by her (who died in 1831) he left two sons—Arthur Richard, the second duke (who also inherited the earldom of Mornington), and Charles, deceased, whose son—Henry Wellesley—is heir-presumptive to the title.

Col. Gurwood's *Dispatches of the Duke of Wellington*, 12 vols.; Gurwood's *General Orders of Duke of Wellington*, 1809-18; Napier's *History of the Peninsular War*; Alison's *History of Europe*; Thibaudeau, *Histoire de l'Empire*; Thiers, *Histoire de l'Empire*; marquis of Londonderry's *Narrative of the Peninsular War*, 1808-13; Gleig's *Life of Arthur, Duke of Wellington*; Bourrienne's *Mémoires sur Napoléon*; Las Casas, *Mémorial de Ste-Hélène*; *La Vie de Wellington*, by Brialmont; *Speeches in Parliament of Duke of Wellington*; *Sir R. Peel's Memoirs*, by his literary trustees; *Supplementary Dispatches and Memoranda of Field-marshal Arthur, Duke of Wellington*, edited by his son, the duke of Wellington, in 14 volumes, 1853-75; also, in continuation of the above, *Dispatches, Correspondence, and Memoranda of Field-marshal Arthur, Duke of Wellington*, in six volumes, 1867-77. An official record of the thoughts and acts of the emperor was issued in Paris, with the sanction of Napoleon III., under the title *Correspondance de Napoleon I.*

WELLINGTONIA, a genus of trees, of the natural order *conifera*, of which only one species is known. *W. gigantea*, the greatest of all pines, and indeed by far the largest tree of temperate climates. The genus is nearly allied to *sequoia* and *taxodium*. The foliage is very similar to that of an arbor vitæ, the leaves being very small, like scales, and closely appressed to small slender branchlets. The leaves of young plants are longer and somewhat needle-shaped. The branches divide into very numerous small branchlets. The flowers are generally solitary and terminal, the male and female flowers distinct but on the same tree. The cones of the *W. gigantea* are ovate, from 1½ to 2 inches long, by 1½ inch broad, single, or in opposite pairs, rarely clustered, the scales wedge-shaped, with about four seeds under each. The *W. gigantea* has a columnar stem, with branches only on the upper half of it, the branches of comparatively small size, and not forming an umbrageous head. The stem attains a height of 300 ft., and sometimes more, perfectly straight and erect. One tree is known, 321 ft. in height; and near it lies a larger one, which has fallen, and which was broken against another large tree in its

fall, its diameter where it was broken, 300 ft. from its base, being 18 feet. Another tree is 102 ft. in circumference at the base. The W. is found only in a limited district in California, on the Sierra Nevada, at an elevation of 4,000 to 5,000 feet above the sea. It was discovered in 1850 by Mr. Dowd, who, being engaged in deer hunting, came with astonishment into the midst of a group of these trees, now known as the mammoth trees of Calaveras. In this locality, within an area of 50 acres, are 123 large trees, 20 of which exceed 25 ft. in diameter at the base, and are therefore about 78 ft. in circumference. A tree which was felled was 302 ft. in height, and 96 ft. in circumference at the ground. It was sound to the center. Its age may be guessed at something like 3,000 years. It was calculated to contain about 500,000 cubic feet of timber. Five men were employed for 22 days in felling it, by boring great auger-holes and sawing between them. When it had been cut through, it remained steadfast on its base, and more than two days were spent in driving in great wedges, to cause it to fall. A round wooden house has been erected on the stump, where dancing-parties sometimes enjoy themselves. For several years, the Wellingtonias of Calaveras were supposed to be the only trees of their kind in existence, but groups have more recently been found in other parts of the same district, and scattered trees in a number of localities. The Wellingtonia has been introduced into Britain, the climate of which is very suitable to it; fine young trees are now to be seen in many places, and plants are common in nurseries. The Wellingtonia has been called *Washingtonia* by some American writers, but no reason except national feeling has been alleged for the change of the name. According to the generally-acknowledged rule in natural history, the older name must be retained.—The usual name now is sequoia. •

WELLS, a co. in n.e. Indiana, drained by the Wabash river; 372 sq.m.; pop. '80, 18,442—17,857 of American birth, 5 colored. Co. seat, Bluffton.

WELLS, an ancient city and municipal and parliamentary borough, in the county of Somerset, pleasantly situated at the foot of the Mendip hills, 15 m. s.w. of Bath. It is a clean and cheerful town, with runlets of water flowing through each principal street. The cathedral, a remarkably beautiful edifice, begun in 704, and enlarged in 1138, is for the most part in early English; but its west front, one of the noblest façades in the kingdom, and which is enriched with 300 statues, is in Gothic. The bishop's palace, originally founded in 1088, is surrounded by a moat supplied from the abundant source of St. Andrew's well—from which the town is said to derive its name—and by lofty walls. There are no manufactures, and the trade is chiefly retail. Pop. '71, 4,518.

WELLS, CHARLES, b. England, about 1798. His name is mentioned by Keats in one of his sonnets as that of an intimate friend. Under the name of "H. L. Howard," Wells published a volume called *Stories after Nature* (prose) in 1822, and in 1824, *Joseph and his Brethren, a Scriptural Drama*. These met with no success, and he abandoned the profession of literature. Within the last twenty years, however, the drama has been extravagantly praised by critics of the Swinburnian school. In 1876 the poem was republished with a critical introduction by Mr. Swinburne.

WELLS, DAVID AMES, D.C.L., b. Mass., 1828; graduated at Williams college, 1847, and at the Lawrence scientific school, 1857. Mr. Wells has devoted much study to questions of political economy and government; was commissioned by the U. S. government to inquire into and publish reports on questions of taxation and revenue, 1865-70; has delivered courses of lectures on political science at Yale college; and has published pamphlets in favor of free trade and on other economical subjects. In 1876 he was a candidate for congress on the democratic ticket, but was defeated. His degree of D.C.L. was received from Oxford university.

WELLS, HORACE, 1815-48; b. Vt.; studied dentistry in Boston, and practiced it for a time there till 1836, when he removed to Hartford, Conn. He had already conceived the idea that some anæsthetic might be used in dentistry to prevent pain. He had thought of the employment of nitrous oxide gas for that purpose as early as 1840. Four years later G. Q. Colton lectured in Hartford, and gave nitrous oxide gas to several persons, who were rendered unconscious of pain. The next day Wells had a tooth extracted without pain under the influence of the gas, and he used it successfully in several cases the same year, and it was used by other dentists in Hartford. Late in 1844 he communicated his discovery to Drs. Hayward, Warren, W. T. G. Morton, C. T. Jackson, and others in Boston, and extracted a tooth from a patient to whom the gas had been given before the Harvard medical school. In 1846 Dr. Morton obtained a patent for anæsthetics against the remonstrance of Wells. After a visit to Paris, where he communicated his discovery to the French medical societies, and on his return to America, he published *A History of the Discovery of the Application of Nitrous Oxide Gas, etc.* (1847). The dispute as to his discovery and constant experiments upon himself with chloroform, produced mental alienation. He was arrested in New York, accused of throwing vitriol on the clothes of women in the street, and he committed suicide.

WELLS, SAMUEL ROBERTS, 1820-75; b. Conn.; in 1844 admitted as a partner into the publishing-house of O. S. & L. N. Fowler. He was an enthusiastic phrenologist; lectured much on phrenology, in this country and Great Britain; was editor of the *Water-*

Cure Journal, 1850-62, and of the *Phrenological Journal* from 1863 till his death. Among his works are *New Physiognomy*, and *How to Read Character*.

WELLS, WILLIAM HARVEY, D. Conn., 1812; principal for some time of the state normal school, Westfield, Mass.; superintendent of public schools at Chicago. He is the author of *Grammar of the English Language*; *Graded Course of Instruction for Public Schools*. He edited *Massachusetts Teacher*, and has contributed largely to educational journals.

WELL-STAIRCASE, a winding staircase with an aperture left in the center, called the *well*, by which light and air are admitted.

WELSER, the name of a famous extinct patrician family in Augsburg. JULIUS WELSER was knighted by the emperor Otto I. for his services in the war against the Hungarians. His son, OCTAVIAN WELSER, settled in Augsburg, and from him descended the patrician family, which always held important posts in the council of that town. BARTHOLOMEW WELSER, privy counselor of the emperor Charles V., was so wealthy that he could vie with the Fuggers (q.v.) in munificence. With the emperor's permission, in 1526, he fitted out three ships in Spain, which, under the command of Ambrose Dallinger of Ulm, sailed for America, and took possession of the province of Caracas, which the emperor gave Welser in pledge. Twenty years after this, the Welsers gave up their possession voluntarily, and it reverted to Spain.—The most famous of the family was the niece of Bartholomew Welser, PHILIPPINE WELSER, a daughter of his brother, Franz Welser, born about 1530. She had received an excellent education from her clever mother, and was exceedingly beautiful. On the occasion of a diet of the empire at Augsburg in 1547, she was seen by the archduke Ferdinand, the second son of the subsequent emperor, Ferdinand I., who fell in love with her. The young girl firmly rejected all the advances of this fiery youth of 19, and refused to have any relation with him excepting by marriage. They were therefore married in 1550, without the knowledge of his father, or of his uncle, Charles V. His father, on hearing the news, was exceedingly angry, and for a long time his son did not venture to appear before him. Even in other countries, this misalliance made a great noise. In the meanwhile, the loving couple enjoyed the greatest domestic happiness, and Philippine enchanted every one that knew her by her intelligence and kindness of heart. It was only after eight years that his father was reconciled. Philippine, in disguise, herself handed him a petition, and by her deportment on the occasion, as well as her beauty, disarmed the angry father. He forgave his son, declared his children legitimate, and raised their mother to be markgraven von Burgau. This happy marriage lasted 30 years. Philippine died at Innsbruck in 1580. In the palace at Schönbrunn the portrait of the lovely Philippine is still pointed out.

WELSH, WILLIAM, 1810-80; b. Penn.; brother of John, who was minister to England, 1877-89; engaged in business in Philadelphia and acquired wealth. He filled many local positions of trust and honor, was a director of Girard college, and a member of the Indian peace commission of Grant's administration. He was for some time connected with the *North American*, and *Gazette*. He is the author of *Tuopi and His Friends, or Indians' Wrongs and Rights*, and other philanthropic pamphlets.

WELSH LANGUAGE AND LITERATURE. The Celtic languages are divided into two groups, Gaelic and Cymric. To the latter of these the Welsh belongs, and has even given name, as forming the most important member of the group, which comprises besides, Armorican (spoken in Bretagne) and Cornish (now extinct). A controversy has been waged concerning the nature and closeness of the intimacy existing between the Gaelic and Cymric tongues, but the question may now be considered settled by the researches of the rev. Richard Garnett (*Gentleman's Magazine*, May, 1839), who found, on examining the monosyllabic words in the introductory part of Neilson's *Irish Grammar*, that out of 270, no fewer than 140 were identical in sense and origin with corresponding Welsh terms, that 40 were cognate, an equal number borrowed from Latin, Saxon, etc., and that only 50 were peculiar to the Gaelic. Nevertheless, it is not to be supposed that the affinity is as close as that which exists between English and so called Scotch. It is rather (according to Mr. Garnett) such as exists between Icelandic and German. A Welshman cannot understand a Highlander or an Irishman; he cannot even understand a Breton (as used to be believed), though the language of the latter is undoubtedly Cymric. Most extraordinary hallucinations were formerly current in regard to the antiquity of the Cymric tongues. Pezron, the Breton investigator, gravely affirmed that Welsh and Armorican (which he considered the same) had been "the language of the Titans, that is, the language of Saturn, Jupiter, and the other principal gods of heathen antiquity." The rev. Joseph Harris, editor of the *Seven Götter*, remarked in 1814 that "it is supposed by some, and no one can disprove it, that Welsh was the language spoken by Adam and Eve in Paradise." *The fact*, on the other hand, is, that of the two branches of Celtic, the Cymric is less ancient than the Gaelic, and that among the Cymric tongues the Cornish is probably older than the Welsh. (See Norris, *Ancient Cornish Drama*, Oxford, 1859.) But preposterous as the views of most patriotic Welshmen are on this subject, it is undoubtedly true that the Welsh is one of the oldest living languages in Europe, and that it possesses a literature reaching back to

remoter times than that of any modern tongue except Irish. The most striking peculiarities of the language are the abundance of its grammatical permutations, and its facility in forming derivatives and compounds. Of the former, two examples may be given by way of illustration. The Welsh word for "father" is *tad*; for "my" *fy*. But you cannot say for "my father," *fy tad*. After *fy*, every word beginning with *t* must change the *t* to *nh*; and therefore the correct phrase is *fy nhad*. So after *ei*, *tad* becomes either *dad* or *thad*, according as *ei* means "his" or "her." The rules of permutation are almost endless, and, in the opinion of such Welsh scholars as are not Welshmen, useless, nothing being gained in point of euphony or expressiveness. The Welsh affirm that their language is exceedingly harmonious, and it would serve no good purpose to dispute the assertion; but foreigners ignorant of the tongue, and associating no definite ideas with the words that issue from a Welshman's lips, generally fail to realize the fact, and consider it in this respect—though not in others—distinctly inferior to Gaelic. The language, or rather the structure of sentences and the phraseology, exhibits a certain staidness, or even grandiloquence, characteristic, indeed, of uncivilized nations. One thing specially deserves notice. The Welsh people are profoundly attached to, and familiar with it. It is not dying out, like Irish or Scotch Gaelic. It has a genuine literary, as well as oral existence even now, and though the changes it has undergone since the days of Taliesin are numerous and great—so great, indeed, that no modern unlettered Cambrian can understand a word of the early poetry of his country—yet it is essentially the same tongue that Cæsar and Agricola heard, and is consequently to be regarded with veneration as the solitary living link that unites those distant ages with our own.

There are extant, says Owen Pughe, some thirty old treatises on Welsh grammar and prosody. The most important of these is one composed by Geraint (880 A.D.), revised by Einion (1200 A.D.), and regularly privileged by the sovereigns who then exercised authority in Wales. It was first printed by the Welsh MS. society in 1856, under the editorship of the rev. J. Williams ab Ithel. Among English grammars of the Welsh language, the best is said to be that by the rev. Thomas Rowland (2d ed. 1857); among dictionaries, that of Owen Pughe, entitled *Geiridur Cymraeg a Saesneg, a Welsh and English Dictionary* (2 vols. 1793; 3 ed. 1861, *et seq.*). It is, however, only a Welsh-English dictionary; the most satisfactory English-Welsh dictionary is that published by Daniel Silvan Evans (2 vols. Denbigh, 1852-1858).

The literature of Wales has been arranged into four periods: the *first* extending from the earliest times of the Norman conquest (1066 A.D.); the *second*, from the Norman conquest to the English reformation (*circa* 1536 A.D.); the *third*, from the English reformation to the beginning of the reign of George III. (1760 A.D.); and the *fourth*, from 1760 to the present day. To what date the oldest specimens of Welsh literature ought to be assigned, has been the subject of sharp dispute. These specimens are in verse and are rhymed. The chief of their alleged authors, with their supposed periods, are Aneurin (510-560 A.D.), Taliesin (520-570 A.D.), Llywarch Hen, or "the Old" (550-640 A.D.), and Myrddin or Merlin (530-600 A.D.). According to Pinkerton (see his preface to *Barbour*) and Laing (*Dissertation on Ossian*), they are not authentic; but the vindication of their authenticity, first by Sharon Turner in 1803, and afterward and more critically, by Mr. Stephens of Merthyr-Tydvil, in his *Literature of the Kymry* (1849), and Mr. Nash, in his *Taliesin, or the Bards and Druids of Britain* (1858), is considered conclusive. The last two of these writers, however, may almost be said to meet their opponents half way. Of the seventy-seven poems ascribed to Taliesin in the *Myeyrian Archaeology of Wales* (a collection of all the most celebrated works in Welsh literature, 500-1400 A.D.), which appeared in 1801—under the auspices of Mr. Jones, Mr. Edward Williams (better known as "Edward of Glamorgan"), and Dr. Owen Pughe—Mr. Stephens considers fifty-seven to be demonstrably spurious, and only twelve to be probably genuine, that is, belonging to the age of Taliesin. Mr. Nash enables us to form an independent judgment on the point, for he translates some fifty of these poems; and we find that, instead of their exhibiting an antique Welsh character, they abound in allusions to mediæval theology, and frequently employ mediæval Latin terms. It is certainly unfortunate for the reputation of the "chief of the bards," that the specimens of his which are considered to be genuine possess exceedingly small poetic merit. The life of this famous but apparently over-rated genius is, of course, enveloped in legend. He is said to have been the son of a certain St. Henwg, and to have been educated at the college of St. Cadog. His life was spent successively at the courts of Urien Rheged, Gwyddno, prince of Cardigan, and King Arthur, and his sepulchre is shown near Aberystwith. It is still called *Bedd Taliesin* (Taliesin's grave). Of the poems whose authorship is ascribed to Aneurin, a prince of the Cumbrian Britons, the most notable is that entitled *Gododin*, in which he pathetically laments a defeat of his countrymen by the Saxons. It is reckoned authentic. (Several English translations of the *Gododin* have been published, and a translation of the whole works of Aneurin was published by Mr. Probert in 1820). Llywarch Hen, also a Cumbrian warrior, is regarded as the finest and most poetical of all the semi-historical Welsh bards. Tradition reports that he lived to the age of 150. The burden of his verse is the miseries of old age, on which he descants with melancholy eloquence. (See *The Heroic Elegies and other Pieces of Llywarch Hen, Prince of the Cumbrian Britons*, with a literal translation by William Owen, 1792). The pieces ascribed to Merddyn, in the *Myeyrian*

Archæology, are in all probability spurious. Besides the names already mentioned, other poets of the first period are Gwyddno, Gwilym ab Don, Golyddan, etc.

The earliest specimen of Welsh prose now extant is the collection of the laws of king Hywel dda, or Howel the good (died 748 A.D.)—a work of great value in illustrating the manners and morals of early Welsh times, but it is very uncertain when or by whom the collection was made. The oldest extant MS. belongs to the 12th century. The latest and most critical edition (Welsh and English) is that published in 1841 by the record commission, and edited by Aneurin Owen, son of Dr. Owen Pughe. Another work, entitled *The Wisdom of Cadog the Wise* (a collection of proverbs pretending to be by a St. Cadog, who flourished in the 6th c., and was a friend of Taliesin), is of such doubtful authenticity that its claim can only be noticed in our sketch.

Second Period, 1066–1536.—A few years after the date of the Norman conquest, a new spirit was imported into Welsh poetry by the influence of Gruffydd ab Cynan, prince of North Wales, and Rhys ab Tewdwr, prince of South Wales, particularly of the former. Gruffydd had been born during his father's exile in Ireland, and was brought up in that country, where he appears to have acquired a familiarity with both the native Celtic literature and that of the Danes-Norse invaders. In the year 1100 he held a great Eisteddfod at Caerwys in North Wales, which was numerously attended by Irish bards and musicians. For the next 300 years, Wales is rich in native bards, a fact that conclusively refutes the tragic story of Edward I. having caused them all to be slain, lest their patriotic songs should stir the Welsh to renew the struggle for independence. Nearly 60 names occur in the *Mygryian Archæology* between 1120 and 1380. The first is that of Meilyr (1120–60), whose best piece is entitled *The Death-bed of the Bard*. Meilyr's son, Gwalchmai ab Meilyr (1150–90), who is said to have accompanied Richard cœur de lion to Palestine, is a superior poet to his father. Fourteen of his productions are extant. Gwalchmai's son, Einion (1170–1220), also figures as a poet. Forty pieces are ascribed to Cynddelw (1150–1206), a contemporary of Gwalchmai, of which probably the most interesting is *The Death-bed of Cynddelw*. He has also some verses addressed to prince Madog or Madoc of Powys, whom enthusiastic Welshmen conceive to have discovered America before Columbus. Other bards of this second period are Llywarch ab Llewellyn (1160–1220); Hywel (1140–70), a brother of prince Madoc, and writer chiefly of erotic odes; Owain Cyveilioc (1150–97), also of princely rank, whose *Hyllas*, or the *Long Blue Horn*, is a great favorite with more than Welshmen; and above all, *Davydd ab Gwilym* (circa 1340–1400), who has been compared to Ovid, to Petrararch, and to Burns. In his verses, Welsh poetry undergoes a change—the bardic or Scaldic spirit disappears, and a more humane, if less patriotic spirit takes its place. Davydd sings of love and of social amusements; he was likewise a fierce satirist, though at times very penitent and pious; while, to complete his resemblance to the Scottish poet, and also to justify the biblical name he bore, he showed an unmistakable predilection for illicit love. Davydd's poems were first published in Welsh, with a biography of the author by Owen Jones and Owen Pughe (1789). An English translation of some of them by Mr. A. Jones appeared in 1834. Besides the poets already mentioned, the following names are in high repute: Iolo Goch, the friend and bard of the famous Owen Glendower, who is said to have lived to the age of 120; Sion Cent ("John of Kent"), a name given him from Kent-church, in Hereford, where he resided (1380–1410), and who, having adopted the opinions of the Lollards, ultimately attained the reputation of a wizard; and Lewis Glyn Cothi, who flourished during the wars of the roses, and was bard to Jasper, earl of Pembroke, son of Owen Tudor and the widow of Henry V.

Prose.—The oldest Welsh chronicler of the second period is Caradoc, a monk of Llancarvan, who flourished in the first half of the 12th century. His work narrates in Welsh the history of his native country from the death of Cadwallader, 689, to the times of Caradoc himself. It is a dry, illiterate affair, like the Anglo-Saxon Chronicle. Contemporary with Caradoc was the famous Geoffrey of Monmouth (q.v.), bishop of St. Asaph, who died in 1154. He, however, though a Welshman, wrote in Latin, and belongs, therefore, rather to the general literature of England than to Welsh literature. His *Chronicle* commences with the fall of Troy, and ends with the death of Cadwallader, so that it forms an introduction to that of his friend Caradoc. In it the legend of Arthur first assumes that romantic and chivalrous form in which modern readers are familiar with it. It is impossible here to enter into a discussion of the question where the materials of the Arthurian romance were first accumulated; suffice it to say, that evidence preponderates in favor of their Welsh origin. To this second period must also be assigned that charming collection, the *Mabinogion*, or Children's Tales, of which a MS. volume of more than 700 pages is preserved in the library of Jesus college, Oxford, and is known as the *Red Book of Hergest*, from the name of the place where it was discovered. A beautiful edition of this work in Welsh and English, with preface and notes, was published in 3 vols. (1838–49) by lady Charlotte Guest. The age of these tales, which relate principally to Arthur and the Round Table, is doubtful. The transcription in the *Red Book of Hergest* belongs probably to the 15th c.; but the date of their composition may be safely held to be much earlier, perhaps somewhere in the 13th century.

The *Triads* may also be here noticed. They are collections of historical facts, maxims ethical and legal, mythological doctrines and traditions, and rules for the structure

of verse; all expressed with extreme brevity, and regularly disposed in groups of three. They were a very popular species of composition among the Welsh, and are of all ages. Examples occur in the poems of Llywarch Hen, but the greater part are found in transcripts and miscellanies of the 16th and 17th centuries. The "historical" triads are especially puzzling. They occur in a so-called collection, made by one Thomas Jones of Tregaron, about the close of the 16th century. This Jones was originally, it seems, an eminent robber—a Welsh "Rob Roy;" but in his later years he reformed, married an heiress, and became a justice-of-peace for the co. of Brecon. The peculiarity of his "collection" is, that it gives a totally different account of the origin of the Britons from Geoffrey of Monmouth, bringing them from a "summer land" (supposed to be Constantinople or the Crimea) over a sea called the "Hazy sea." The question arises, and has not been settled: Whether are we to suppose Jones the fabricator of these "triads" or his account of the origin of the Britons the genuine record of an ancient tradition? In favor of the former hypothesis, unfortunately, is the circumstance that there is no trace of such an ancient tradition in the anterior literature of Wales.

Third Period (1536–1760).—This and the remaining period may be briefly sketched. The most notable fact in its commencement is the comparative ease with which the reformation made its way among the Celts of Wales. The Celts of the Highlands remained for a time, and those of Ireland remain to this day, obdurate adherents of the old faith; but those of Wales, on the whole, swiftly accepted the new religion. The art of printing had been in operation in England for more than half a century before it was applied to the Welsh language. The first book printed in the Welsh or any Celtic language was an almanac, with a translation of the Lord's prayer and the ten commandments (Lond. 1546). The author, William Salesbury, was a scholar and a zealous Protestant. In 1547 he published the first dictionary of English and Welsh, and executed the greater part of the first translation of the New Testament into his native tongue (Lond. 1567). In 1588 appeared the earliest translation of the whole Bible into Welsh. The author was a Dr. William Morgan, afterward bishop of St. Asaph's. A revised edition of this, in 1620, by Dr. Parry, Morgan's successor in the bishopric of St. Asaph's, is the translation still in use among the natives of the principality. Contemporary with Salesbury, but an adherent of the old faith, was Dr. Griffith Roberts, who lived on the continent, and published at Milan a Welsh grammar in 1567. Another contemporary was Dr. John David Rhys, whose principal work, *Cymrobrÿtannica Cymraeere Linguae Institutiones et Rudimenta*, is a treatise on Welsh grammar. The suspicious Thomas Jones of Tregaron, possible author, rather than collector of the "historical" triads, was a friend of Rhys, and died about 1620. In 1603 capt. Myddleton, one of the first three persons who smoked tobacco in England, published a metrical version of the Psalms in Welsh, partly executed while cruising about in the West Indies. The most celebrated poets of the *third* period are the rev. Rics Prichard, vicar of Llandovery (1579–1644), whose *Cawryll y Cynry* (Candle of the Cambrians) is a metrical version of his professional homilies or sermons, the eloquence of which had previously won for him a great reputation as a preacher; it is still popular, the 20th edition having appeared as late as 1858: Huw Morus, or Hugh Morris (1622–1709), author of a variety of pieces, which his countrymen consider unsurpassed in humor, pathos, and even sublimity—an edition in 2 vols. appeared at Wrexham (1823), under the title of *Eos Ceiriog* (the Nightingale of Ceiriog); and Goronwy Owen (1722—*circa* 1780), a gifted bard, but likewise an incurable drunkard, whose principal poems are contained in the first volume of a book entitled *Diddanwrch Teulnaidd* (Domestic Amusement, Lond. 1763). Of the prose writers, the only noteworthy are Ellis Wynne (d. 1734), author of the *Bardd Cwsg* (Sleeping Bard, 1703), a series of visions of hell and Hades, written with great beauty of style; and the rev. Moses Williams (1685–1742), an antiquarian scholar of high merit, whose *Repertorium Poeticum*, or list of Welsh poems and catalogue of Welsh books, is very valuable.

Fourth Period (1760 to present time).—Various causes co-operated to give a new impetus to Welsh literature after the accession of George III. Among these, the most powerful were the establishment of periodical publications, the institution of patriotic societies, and the spread of Methodism. The first important production of this period is entitled *Some Specimens of the Poetry of the Ancient Welsh Bards translated into English* (Lond. 1764), by Mr. Evans, curate of Llanvair Talyhaern, in Denbighshire. The next name deserving of mention is that of Owen Jones (1741–1814), who, though engaged in mercantile occupations all his life, managed, by his enthusiasm and liberality, to quicken and extend the public interest in Welsh literature. In 1771 he founded the *Gwyneddigion* (society of the "men of Gwynedd"), which gave prizes for the best performances on the Welsh harp, and the best Welsh poems. In 1801–1807, he caused to be published at his own expense, under the editorship of Owen Pughe and Edward Williams, three volumes of the *Myvyrian Archaeology*, so called in honor of himself, who had assumed the bardic name of Myvyr, from his native vale in Denbigh. Owen Jones was, however, rather a Welsh Mæcenas than a Welsh *littérateur*. The next names of importance are those of the editors just mentioned—Owen Pughe and Edward Williams. The former (1759–1835), according to Southey, was a "muddy-minded man;" nor is the fact that he was a follower of Joanna Southcott, and one of her twenty-four elders, adverse to this description of his intellect. Be this as it may, Owen Pughe is the great Welsh lexicog-

rapher; his dictionary of Welsh (1793-1803) contains 100,000 words, illustrated by 12,000 quotations. He also translated *Paradise Lost* into Welsh, in which work he threw off the chains of Welsh alliteration, an innovation generally acknowledged to be an improvement. Edward Williams (1745-1826), better known as Iolo Morganwg, is probably the finest Welsh genius of the fourth period. Southey knew him, and liked him greatly. His principal productions are *Salmu yr Eglwys yn yr Awddech* (Psalms of the Church in the Desert); but an *Ode on the Mythology of the Ancient British Bards in the Manner of Taliesin* (1792), accompanied by notes and specimens of "triads," containing the metaphysical and religious doctrines of the old Druidical bards, provoked a long-protracted controversy. Morganwg said that he had copied them from a MS. collection of a Welsh poet, *anno* 1560, which was in his possession, and affirmed that the collection was of very great antiquity. He was often asked to produce it, but always declined; and Welsh critics of the stricter sort have now ceased to believe in its existence. The three associates in the publication of the *Myeirian Archaeology* had each one son, and all of these have become eminent in connection with the literature of their native country. Taliesin Williams (1787-1847), son of Edward Williams, wrote poetry both in Welsh and English; Aneurin Owen (1792-1851), son of Owen Pughe, among other works, published an important collection of the *Laws of Wales*; while Owen Jones, son of Owen Jones, the Welsh Mæcenas (died 1874), had a high reputation as an architect, the Alhambra at Sydenham being a favorable specimen of his professional talents. The fourth period of Welsh literature is naturally richer in critical than in creative works. Among Welsh antiquaries may be mentioned the rev. Edward Davies (1756-1831), author of *Celtic Researches* (1804) and *Mythology of the Druids* (1809); the rev. Thomas Price (1787-1848), author of the *Hanes Cymru a Chennid y Cymry* (1836-1842), a history of Wales and of the Welsh nation from the earliest times to the death of Llewellyn; an admirable work, comprehensive, critical, and literary (Price was an ardent and voluminous writer, contributing to no fewer than 15 periodicals at the same time); and the rev. John Williams ab Ithel, rector of Llany-mowddwy in Merioneth, and editor of the *Cambrian Journal*. In 1856 he edited, for the Welsh MS. society, the *Grammar of Edeyrn, the Golden-tongued*, said to be composed about 1270; in 1860 the *Brut y Tyceyrogion*, or chronicle of the princes; and in 1861 (*et seq.*), *The Traditionary Annals of the Cymry*, reprinted from the *Cambrian Journal*. Williams is a rather credulous and uncritical writer, but a scholar of undoubted merit. Probably the ablest recent Welsh scholar was the late Mr. Thomas Stephens of Merthyr-Tydvil, a man at once patriotic and honest, enthusiastic and critical. To him, above all others, Englishmen desirous of obtaining some clear and credible knowledge of Welsh literature, ought to apply. His principal works are *Studies on British Biography, and Literature of the Cymry in the Twelfth and following Centuries*. The enlightened views of Stephens have met with great acceptance among such English scholars as have paid attention to the subject of Welsh history and literature.

The poetry of the fourth period is not remarkable. The principal names are—David Richards of Dolgelly (1751-1827), author of a sort of epic on the Trinity—a very unsuitable subject for an epic—and a paraphrase of the history of Joseph; David Thomas of Caernarvon (1769-1832), who was very successful at the Eisteddfods; David Owen of Givion (1781-1841), whose poems were collected and published under the title of *Blodau Arfon* (Flowers of Arvon); the rev. Daniel Evans, a collection of whose pieces was published at Llandovery in 1831, under the title of *Gwiallan y Bardd* (The Poet's Vineyard); the rev. Walter Davies (1761-1849), also great at Eisteddfods; the rev. James Hughes (1779-1846); the rev. William Rees of Liverpool, author of a spirited paraphrase of the Book of Job, etc.; and the rev. William Williams of Caernarvon, author of *Grawn Awen* (The Treasure of the Muse), etc.

A good deal of indifferent Welsh prose has been written during this period on religious subjects, owing to the spread of Methodism among the Welsh, but it may profitably be overlooked by a foreigner; and with a glance at the history of Welsh periodicals and societies, we close our brief survey of the subject. The first Welsh periodical, edited by the rev. P. Williams and Evan Thomas, appeared about 1770, and was entitled *Yr Ewgrawn Cymrag* (The Welsh Treasure), but the first that attained any measure of success was the *Seren Gomer* (Star of Gomer), which was published at Swansea (1814). In 1831 *Y Drysorfa* (The Treasury) was commenced, under Calvinistic auspices; in 1836 *Y Ddrygier* (The Reformer), and *Y Dysgelydd* (The Teacher); 1833-41, *Y Gwladgarer* (The Patriot), more a literary than a theological magazine, and tolerably clever; *Yr Haul* (The Sun), a journal advocating the interests of the established church; and *Y Traethodydd* (The Essayist), commenced at Denbigh (1845), distinctly the best literary organ in Wales. In 1879 above 60 daily or weekly newspapers appeared in the principality; of these about a dozen were published in Welsh. There are also about the same number of monthly or weekly magazines or periodicals, helping to keep alive the ancient speech; and two quarterlies in the Welsh language, but on general subjects. There are besides Welsh magazines conducted in English. The *Cambrian Register*, the *Cambro-Briton*, the *Cambrian Quarterly Magazine*, and the *Cambrian Journal*, each of which appeared for a series of years, dealt almost exclusively with Welsh subjects. A Welsh Encyclopædia (*Encyclopædia Cambrensis*—*Y Gwyddoniadur Cymreig*) was begun under the editorship of the rev. John Parry of Bala, in 1856. The *Achlyogia Cambrensis*, the journal of the Cambrian archaeological association, began to appear in 1846. The

Emecogion Cymru (1862) of the rev. Robert Williams is a useful biographical dictionary of ancient Welshmen.

The leading Welsh societies, literary and antiquarian, that have existed, or still exist, are the Cymmrodorion, established in London in 1751, which lived for 30 years; the Gwyneddigion, also established in London in 1771, but extinct some 20 years ago; a second Cymmrodorion (1820-43); the society for the publication of ancient Welsh MSS. (founded at Abergavenny, 1837); and the Cambrian institute, founded in 1853. The Eisteddfod, the annual national "sitting" for the encouragement of bardism, music, and general literature, dates from the end of the 4th century. The meeting lasts three or four days, a president and conductor are appointed for each day, and it is attended by thousands of persons of all classes. Prizes and medals are given for the best poetical, musical, and prose compositions, for the best choral and solo singing, and singing with the harp. On the last day, the great event of "chairing" the fortunate bard takes place.

WELSH ONION, or CIBOL, *Allium fistulosum*, (see ALLIUM), a perennial plant, a native of Siberia. It has fistular leaves and no bulb. Its leaves appear very early in spring, and are then used in soups and salads. Its flavor more resembles that of garlic than of the onion. It has been long cultivated in kitchen-gardens in Britain, and perhaps deserves more attention than it receives, because it is ready for use before any similar plant in spring. The seed is sown in spring or summer; leaves fit for use are produced in the following spring, and the bed continues to be productive for a number of years. The name Welsh onion is from the German *Wälsch*, and merely indicates a foreign origin.

WELSHPOOL (often vulgarly called Pool), a municipal and parliamentary borough of north Wales, in the co. of Montgomery (of which it is considered the capital), 18½ m. w.s.w. of Shrewsbury. Powis castle is an ancient edifice, the oldest parts dating from the 12th c.; and the park is much admired. Woolen mills, tanneries, and malt-houses are in operation. Pop. of parliamentary borough '71, 6,983. Welshpool is connected by a branch with the Shrewsbury and Hereford and other railways.

WELWITSCHIA, a remarkable plant discovered by Dr. Welwitsch at Mossamedes, on the w. coast of Africa, in 1863, and named after him by Dr. J. D. Hooker, the celebrated English naturalist. Its reproductive organs place it among the *gnetaceæ*, a small family related to the conifers. It is never over a foot high, while its trunk may be 5 or 6 ft. in diameter. The seed-leaves, or cotyledons, which soon perish in most plants, continue to grow in Welwitschia, and are the only leaves it ever has, even if it lives for more than a century. All the growing parts of the plant are the very short, broad trunk, which rests upon a strong, tapering root, and the seed leaves above-mentioned, which grow to be 6 ft. long, and from 2 to 3 ft. wide; green, very thick and leathery, and spreading out upon the ground; often torn and split by the winds. As the trunk increases each year in diameter, the leaves are left inserted in a circular groove, between the upper portion of which and the upper surface of the leaves, the flower-stalks spring. They are from 6 to 12 in. high, much branched, and bearing at the end of each branch a cone of scarlet scales, which overlap each other in four rows, each containing a flower. These cones grow to be about 2 in. long, and 1½ in. in diameter. This great natural curiosity grows upon a stony, sandy plateau, between 300 and 400 ft. above the level of the sea, in a region where there is seldom any rain. Sometimes the whole surface of the ground is almost covered with these plants, varying from a few inches in diameter to several feet. The plant is believed to live over 100 years.

WEN'CESLAS or **WENZEL**, Emperor of Germany, 1361-1419; son of Charles IV., whom he succeeded in 1378. He at first was friendly to the cities, but afterward abandoned their cause. About 1390 he canceled all debts due to Jews upon payment to himself of from 15 to 30 per cent of the amount. In 1394 the Bohemian nobles organized a conspiracy, arrested him, and confined him at Prague; but he was released by the influence of the German princes. Having joined with France to demand the abdication of popes Boniface IX. and Benedict XIII., and the election of a new pope, he was deposed by some of the German princes in 1400, and Rupert of the palatinate was chosen to succeed him. Soon afterward his brother Sigismund arrested him, and imprisoned him in Vienna; and in 1410 he resigned his rights as emperor to Sigismund. He showed some friendship for Huss.

WENDS (from the same root as to *wend*, to *wander*, and signifying the wandering or roving border tribes), the name given by the Germans to a branch of the Slaves (q.v.) which, as early as the 6th c., occupied the n. and e. of Germany from the Elbe along the coast of the Baltic to the Vistula, and as far s. as Bohemia. They were divided into several tribes, which were successively subdued by the Germans, and either extirpated or gradually Germanized and absorbed, although remnants of them are still here and there to be found. In a narrower sense, the name of Wends is given to those remnants of the Slavic population of Lusatia who still speak the Wendic tongue, and preserve their peculiar manners and customs. They number about 150,000. A collection of Wendic songs was published by Haupt and Smaler (2 vols., Grimma, 1843-44). The Wends, like the other subject Slavic tribes, were, in early times, cruelly oppressed by their German masters; in recent times their lot has been more tolerable.

WENER, LAKE, the largest lake in the Scandinavian peninsula, and after the lakes Ladoga and Onega in Russia, the largest in Europe, is situated 150 m. w.s.w. of Stockholm, and about 30 m. inland from the Cattegat. It is over 90 m. in length, and varies from 15 to 48 m. in breadth, is 309 ft. in greatest depth, and lies 150 ft. above sea-level. Area 2,005 sq. miles. From the n. shore a peninsula extends southward into the middle of the lake; and from the southern shore a peninsula extends northward to within about 15 m. of the point of the northern peninsula; the portion of the lake lying to the w. of these peninsulas receives the name of Dalbo lake. Of the numerous rivers that feed the lake, the chief is the Klar, from the n., and its surplus waters are discharged into the Cattegat by the river Göta. It is connected by a canal with lake Wetter, by means of which the Göta canal, lake Roxen, etc., inland communication is established between the Cattegat and the Baltic sea. The lake is rich in fish; it is often visited by sudden gusts of wind, and is in many places too shallow for navigation.

WENLOCK, a parliamentary and municipal borough in the county of Salop, 12 m. s.e. of Shrewsbury. Pop. of parliamentary borough '71, 21,208. The principal buildings in Much Wenlock are the church, a building of considerable antiquity, bearing traces of Saxon and Norman architecture; and the town-hall, a venerable and interesting structure, decorated internally with elaborate oak carvings of the time of Charles II. There are also a savings-bank and a public library and reading-room. The extensive ruins of Wenlock abbey afford a rich treat to antiquaries. The abbey was founded in the year 680, and was the parent church of Paisley abbey, Scotland. The remains have been carefully preserved from further dilapidation by the owner, J. Milnes Gaskell, esq., formerly M.P. for the borough, who converted a portion of them into an occasional residence for himself. Wenlock is an ancient municipality, with separate quarter-sessions, and is the first borough that acquired the right by charter of representation in parliament. The town of Wenlock proper, or Much Wenlock, is but small; but the parliamentary borough comprises 12 parishes, spreading over a large area, and includes the market-towns of Madeley, Broseley, and Ironbridge, and the populous district of Coalbrookdale, where important iron and brick and tile works are carried on. There are also extensive limestone quarries in the neighborhood. There is a railway connecting Wenlock with the Severn Valley railway at Buildwas, and another connected with the Shrewsbury and Hereford line.

WENLOCK GROUP, an important series of rocks of upper Silurian age, which are largely developed in the neighborhood of Wenlock. The group is divided into an upper and lower series. The upper, known as the Wenlock limestone, consists of a considerable thickness, sometimes reaching 300 ft., of a gray sub-crystalline limestone, so hard that it has withstood the weathering which has removed the softer shales above and below it. It forms a ridge parallel to that of the Aymestry limestone, running for 20 m. n.e. to s.w. through the south-eastern portion of Shropshire. Sometimes it contains huge concretionary masses of crystalline carbonate of lime, locally named "ball-stones;" in other places, it becomes thin and flaggy. It abounds in fossils, especially in corals, crinoids, mollusca, and trilobites. The lower Wenlock series consists of 1400 ft. of Wenlock shale, and 150 ft. of Woolhope limestone and grit. The Wenlock shale is generally a dark gray, almost black argillaceous rock, often containing elliptical concretions of impure earthy limestone. It is worked in some places for flagstones and slates. The Woolhope limestone and grit consists of gray argillaceous nodular limestones resting on fine shales. In Denbighshire it appears as a coarse grit, often of great thickness, and producing a very barren soil. The fossils of the lower Wenlock beds are of a similar character to those of the upper series.

WENS are encysted tumors, much more common on the scalp than in any other situation, though occasionally observed on the face, shoulders, etc., and consisting of obstructed sebaceous glands, which enlarge by the internal pressure of their accumulated secretions. The closed orifice may be often noticed in the form of a small dark point, and in that case the duct may sometimes be gradually enlarged by the gentle introduction of a probe or director, and its contents pressed out. By this treatment they may, at all events, be kept from being unsightly, and will sometimes shrivel up and disappear. If this treatment fail, and the patient finds the tumor so annoying that he insists upon its removal, it must be exterminated with caustic or the knife. In consequence of the well-known dangers (especially erysipelas) that frequently follow cutting operations of the scalp, the caustic treatment is generally preferable. The most prominent part of the wen must be thoroughly cauterized with nitric acid or potash, which will lead to the formation and separation of a slough, which will lay open the tumor, which may then be left to empty itself and wither, or may be emptied by pressure, and cauterized within. As a general rule, wens are better left alone, unless they can be emptied by simple pressure, as severe operations on them are frequently attended with danger.

WENTLETRAP, *Sec'aria*, a genus of gasteropodous mollusks, of the family *turritellidae*. The shell is spiral, with many whorls, the whorls deeply divided, and not always close together, crossed by remarkably elevated ribs, the aperture round and rather small. The animal is furnished with a proboscis, and has the eyes placed on an external convexity, the foot short and oval. About 100 species of this genus are known. Those which have the whorls close together are called false wentletraps by shell collectors;

those in which they are not contiguous are known as true wentletraps. Of the former, some are found in northern seas, as *scalaria communis* on the coasts of Britain and of continental Europe, and *S. Grandlandica* on those of North America. *S. Grandlandica* is particularly abundant on the banks of Newfoundland, and forms part of the food of the cod. The true wentletraps are all natives of the seas of warm climates. Some of them are very beautiful. A species found in the s.e. of Asia, and known as the PRECIOUS WENTLETRAP (*S. pretiosa*), was once in such esteem among shell collectors that an extremely fine specimen is said to have been sold for 200 guineas; and an ordinary price was from three to five pounds. This shell may now be purchased for a few shillings. It is from 1½ in. to 2 in. long, snow-white, or pale flesh-colored, with eight separated—but not widely separated—whorls.

WENTWORTH, a co. in central Ontario, having lake Ontario for its e. boundary, drained by the head-waters of Welland river and other small streams: 454 sq.m.; pop. '71, 57,599. Co. seat, Hamilton.

WENTWORTH, BENNING, 1696-1770; b. N. H.; graduated at Harvard college in 1715. He engaged in mercantile pursuits and acquired an ample fortune. He was appointed a member of the council in 1734, was frequently a member of the assembly, and was royal gov. of New Hampshire, 1734-67. The town of Bennington, Vt., was named after him. He was a benefactor of Dartmouth college, to which he gave the site for its buildings. His grants of land in s. Vermont involved a long dispute with New York.

WENTWORTH, JOHN, 1719-81; b. N. H.; called to the bar; served in the colonial legislature, 1768-75, and was its speaker in 1771. He was active on the patriotic side during the revolutionary movement; was chairman of the correspondence committee; president of the convention of 1774, and a member of the council, 1776-81. He was judge of the Strafford co. (N. H.) court of common pleas, 1773-76, and of the supreme court, 1776-81.

WENTWORTH, Sir JOHN, LL.D., 1737-1820; b. N. H.; graduated at Harvard, 1755. In 1765 he was sent to England to present petitions from his native province, and in 1766 was made governor of New Hampshire and "surveyor of the king's woods in North America." As governor, he gave a charter to Dartmouth college, and endowed it with nearly 45,000 acres of land. The dislike of the revolutionary party became intense against Wentworth in 1774 on account of his assisting Gage in his fortifications, and he fled to England. After peace was declared he returned to Nova Scotia, and became, 1792, lieut. gov. of the province. His baronetcy was given him in 1795.

WENTWORTH, JOHN, JR., 1745-87; b. N. H.; son of John. He graduated at Harvard college in 1768, and at once began to take part in public affairs. He was a member of the committee of safety, and of the legislature during the revolution. He served in the continental congress, 1778-79; was a member of the council, 1780-84, and state senator from 1784 till his death.

WENTWORTH, JOHN, LL.D.; b. N. H., 1815; graduated at Dartmouth college, 1836, and was for many years editor of the Chicago *Democrat*. In 1843 he was elected to congress from the district which includes Chicago, and served six terms, leaving the old democratic party on the organization of the republican party. He has been mayor of Chicago several times, and was a member of the Illinois constitutional convention of 1861.

WENTWORTH, WILLIAM, about 1615-97; b. England. He was the first of the extensive family of that name in this country. In 1639, in company with rev. John Wheelwright and others, he entered into an agreement for a settlement at Exeter, N. H., and afterward resided at Wells, Me., and at Dover, N. H. He was a ruling elder and preacher.

WERDAU, a t. of Saxony, on the river Pleisse, 40 m. directly s. of Leipsic, and 49 by railway. Pop. '75, 11,689, mostly engaged in manufacturing cloth and in yarn-spinning.

WERDEN, a t. of Rhenish Prussia, on the Ruhr, 17 m. n.e. of Düsseldorf. Pop. '75, 6,744, employed in the manufacture of cloth, linen, and silk, and alum and coal-mining.

WERDEN, REED, b. Penn., 1817; graduated at the Philadelphia naval academy, and became a midshipman, 1834. At the outbreak of the rebellion he was a lieut., and in the Roanoke island and New Bern naval contests he commanded the *Stars and Stripes*, fighting his ship with great gallantry. In 1866 he was made capt.; in 1871, commodore, and in 1875, rear-admiral.

WEREGILD (Ang.-Sax., *wer*, man; and *geld*, satisfaction), a composition by which, according to the custom of the Anglo-Saxons, Franks, and other Teutonic people, homicide and other heinous crimes against the person were expiated. There was an established progressive rate of weregild for homicide, varying at different times and among different Teutonic tribes, from the weregild of the *eorl*, or peasant, to that of the king. In the time of Tacitus, the weregild for homicide among the Germans was due to the relatives of the deceased; that for other crimes one-half to the injured party, and one-half to the state. The sum paid to the relatives in case of homicide, also known as the *man-wyrth*, seems to have been looked on as the equivalent of the dead man's value.

As the power of the community or king increased, the exaction of retribution for the death of its members was considered to be the duty of the state as well as of the relatives, and the principle of division was applied to homicide as well as minor crimes; each payment being a separate full equivalent for the value of the deceased; the one to appease the feud, the other to make atonement to the state. This double weregild is recognized in the compensation for the death of a king by the laws of the Mercians and Northumbrians. In the days of Edward the elder the weregild had become a much more complicated penalty, the composition for homicide consisting of four different payments, two of which, the *fight-æde*, or penalty for a breach of the peace, and the *werigild*, went to the king as head of the state; while a sum called the *halsþing* was paid to the kindred to loosen the hand of the avenger of blood, and the *manbot* was given to the overlord to compensate him for the loss of a vassal. The graduated scales of weregild in use among the different Teutonic nations throw much light on the gradations of society at the period. It does not appear that among the nations who recognized the principle of weregild, the relatives were bound to accept a compensation for their kinsman's slaughter, in place of appeasing the death-feud by blood; the latter practice was often resorted to instead. It was only through the exertions of archbishop Theodore that Egfrid, the Christian king of the Angles of Northumbria, adopted the alternative of accepting a weregild for his brother slain in battle by the Mercians, in place of demanding the blood of the slayer. A similar principle to that of weregild for homicide seems to have been recognized by the Celtic nations, and there are traces of it in the Mosaic code.

WERE-WOLF (Ang.-Sax. *wer*, a man), a man-wolf, a man who, either periodically or for a time, is transformed, or transforms himself into a wolf, becoming possessed of all the powers and appetites of a wolf in addition to his own, and being especially remarkable for his appetite for human flesh. The belief in the transformation of men into wolves or other beasts of prey has been very widely diffused; there is perhaps no people among whom some evidence of its former prevalence does not exist. It is not yet extinct, even in Europe. In many of the rural districts of France, the *loup-garou* (the latter part of the word is a corruption of the Teutonic *wer-wolf*) is still an object of dread. This superstition lingers too among the country-people of northern Europe, and a particular form of it flourishes vigorously among the Bulgarians, Slavonians, and Serbs, and even among the more intelligent inhabitants of Greece. See VAMPIRE. Its details vary in different countries and districts. The definition given above includes only the commonest and the best marked of its incidents. Probably it has not yet entirely disappeared in any country whose rural districts are infested with wolves or other wild animals; and manifestations fitted to suggest it may be occasionally observed in the mad-houses of most countries. See LYCANTHROPY. The animal whose shape is taken, as already stated, is not always, though usually, a wolf; it was probably always the animal most formidable, or considered most inimical to man. In Abyssinia it is the hyena.

Occasional notices of lycanthropy, as it is called, are found in classical writers; and lycanthropy, as there described, was the change of a man or woman into a wolf, so as to enable the man or woman to gratify an appetite for human flesh, either by magical means, or through the judgment of the gods, as a punishment for some dire offense. Sometimes the transformation was into the shape of a dog or a bull. Ovid, in his *Metamorphoses*, tells the story of Lycæon, king of Arcadia, who, when entertaining Jupiter at a banquet, resolved to test his omniscience by serving up to him a hash of human flesh. The god, to punish him for this, transformed him into a wolf. Herodotus describes the Neuri as sorcerers who had the power of taking once a year, for several days, the shape of wolves; and the same account of them is given by Pomponius Mela. Pliny relates that, in Arcadia, every year, at the festival of Jupiter Lycaeus, one of the family of Antæus was chosen by lot, and conducted to the brink of the Arcadian lake, into which, after having hung his garments upon a tree, he plunged, and was transformed into a wolf. Nine years after, if alive, he returned to his friends, looking nine years older than when he disappeared. Some notices of lycanthropy are to be found in Petronius; and allusion to it is also made by Virgil in the 8th *Eclogue*. Marcellus Sidetes tells us of men who, every winter, were seized with the notion that they were dogs or wolves, and lived precisely like these animals, spending the night in lone cemeteries. This disorder attacked men chiefly in the beginning of the year, and was usually at its height in February. It is worth while observing that the classical instances of lycanthropy mostly refer to Arcadia, a pastoral country, whose inhabitants suffered greatly from the ravages of wolves.

In Norway and Iceland, it used to be believed that there were men who were "not of one skin." Such men could take upon themselves other shapes than that of man, and the natures corresponding to the shapes which they assumed; they had the strength and other powers of the animal whose shape they bore, as well as their own. It was believed that the change of shape might be effected in one of three ways: simply by putting on a skin of the animal; by the soul of the man deserting the human body—leaving it for a time in a cataleptic state—and entering into a body borrowed or created for the purpose; or, without any actual change of form, by means of a charm, which made all beholders see the man under the shape of the animal whose part he was sustaining.

The two former were the common modes of transformation, at any rate, the sagas are full of illustrations of them; while illustrations of the third mode are comparatively rare. Nothing of the man remained unchanged except his eyes; by these only could he be recognized. Odin had, and freely exercised, the power of varying his shape. When men changed their shape to prey upon their kind, they always took the form of a wolf. It was believed that many had the power of thus transforming themselves; and great was the popular dread of were-wolves. Perhaps the best stories of were-wolves which are to be found are contained in the northern sagas. Scarcely anywhere did the belief in them go so deep into the minds of the people as among the northern races. In connection with it, notice may be taken of what is called the "Berserkr rage," which appears to have been a peculiar form of mania. The Berserkr yelled like dogs, or wolves rushing into conflict, bit their shields with their teeth, and committed terrible atrocities while the paroxysms of their disease were upon them. Berserkr has been rendered "bare-skinned;" others make it mean "wolf-skin-coated" (why not "bear-skin-coated?").

Olaus Magnus states that in Prussia, Lithuania, and Livonia, though wolves were very numerous and troublesome, the ravages of the were-wolves were regarded as much more serious. Every year at the feast of the nativity at night, the were-wolves assembled in great numbers at appointed places, and proceeded to look out for human beings, or tame animals, upon which they could glut their appetites. If they found an isolated house, they entered it, and devoured every human being and tame animal it contained; after which—showing that they were not common wolves—they drank up all the beer or mead. Similar testimony with regard to Livonia is given by bishop Majolus, who adds, that the transformation into the wolf-form continued for twelve days.

Instances of persons being changed into wolves by way of punishment, were freely believed in the middle ages; for example, St. Patrick was believed to have changed Vereticus, king of Wales, into a wolf; and there was an illustrious Irish family which had incurred the curse of St. Natalis, every member of which, male and female, according to the popular belief, had to take the shape of a wolf, and live the life of a wolf for seven years.

In the 15th and 16th centuries, the belief in were-wolves was, throughout the continent of Europe, as general as the belief in witches, which it had then come to resemble in many respects. It gave rise to prosecutions almost as frequent as those for witchcraft (q.v.), and these usually ended in the confession of the accused, and his death by hanging and burning. It was calculated to inspire even greater terror than witchcraft, since it was believed that the were-wolves delighted in human flesh, and were constantly lying in wait for solitary travelers, and carrying off and eating little children. The were-wolves, like the witches, were now regarded as servants of the devil, from whom they got the power—often exercised by anointing with a salve—of assuming the wolf's form; and it was believed that great numbers of them trooped together to the devil's Sabbath. The stories of mutilations and other mishaps befalling them in the wolf-state, by which, when they resumed the human form, they were identified as were-wolves, exactly resemble the stories told of witches. In Sept., 1573, we find a court of parliament sitting at Dole, in Franche-Comté, authorizing the country-people to take their weapons, and beat the woods for a were-wolf, who had already—thus went the recital—"carried off several little children, so that they had not since been heard of, and done injury to some horsemen, who kept him off only with great difficulty and danger to their persons." Throughout Europe, the judicial cognizance of witchcraft and of lycanthropy ceased at the same time. In Great Britain, where wolves had early been exterminated, the were-wolf was only known by rumors coming from abroad; but the belief that witches could transform themselves into cats and hares, which did prevail, was precisely analogous to the belief in were-wolves, especially in its later forms.

The later forms of this strange belief were obviously sophisticated. In its earlier shape, three things are to be noticed—the power ascribed to the were-wolf of transforming himself, either by changing the shape of his own body, or projecting his spirit into another body; his appetite for human flesh; his taking the shape and nature of the animal held to be most malicious against man—the wolf. As to the first of these, all that can here be done is to point to its connection with the doctrine of transmigration (q.v.), and to add that it has been one of the commonest of human beliefs. As to the second, is it unlikely that in the early times in which the superstition had its origin, the appetite for human flesh may have been common enough to spread terror through whole districts? It is, at least, not improbable that every race of men has had an experience of cannibalism; and it may well have been that, in occasional cases, especially under conditions of disease, the taste for human flesh survived the general practice of using it. Modern Europe affords many unquestionable examples of this taste existing and being indulged in the midst of comparative civilization. There can be no doubt that some of the unhappy multitude put to death as were-wolves had really murdered and eaten the flesh of human beings. But secret murders, unaccompanied by cannibalism, would tend to support a popular belief in cannibalism. We have not to go out of our own age for proofs of the existence of men afflicted with a homicidal tendency; and in times when the means of detecting crimes were very imperfect, it is conceivable that the murders committed by one or two such persons would spread terror, and give support to a superstitious theory throughout a large district. The *maréchal de Retz*, who lived

in the time of our Henry VI., had caused to be stolen and put to death by torture, under the most inhuman circumstances, many hundred children—he confessed on his trial that he murdered 120 in a single year. (A memoir of Gilles de Laval, *maréchal de Retz*, has been compiled from authentic documents by P. J. Lacroix, the eminent French antiquary.) Perhaps no society has ever been free from men similarly constituted, and acting similarly according to their opportunities. As to the third point, if it be granted that a certain practice of, or general suspicion of cannibalism existed among a people who believed in the power of transformation, it is easy to understand how the cannibal, getting his victims by stealth, was supposed to indulge his inhuman appetite under the guise of the animal most unfriendly to man. And the existence of a form of mania in which the madman had the hallucination that he was changed into a wolf, yelled like a wolf, lived in many respects like a wolf, was calculated strongly to confirm the belief in men-wolves. In conjunction with the mischief done by real wolves, this itself may be thought almost enough to have given origin to the superstition. The hallucination of having undergone transformation into a wolf from time to time, seems to have been one of the commonest by which weak and crazed brains were possessed during the period when the hunt for were-wolves was kept up. The literature of this subject, though abundant, is for the most part fragmentary, and mixed up with other matters. A good account of the subject will be found in *The Book of Were-Wolves*, by Sabine Baring-Gould (Lond. 1865).

WERGELAND, HENRIK ARNOLD, 1808–45; b. Norway; educated at Christiania university. He entered the ministry, but withdrew from it in 1834, the sentiments uttered in his poem called *Creation, Man, and the Messiah* being thought inconsistent with his profession. He then studied medicine. In 1840 he was made keeper of the national archives. His dramatic and lyrical productions were long popular in Norway.

WERMLAND, a län in s.w. Sweden, adjoining Norway; drained by the Klar river; 6,500 sq. m.; pop. about 275,000. It contains lake Wener, which has an area of some 2,000 sq. m., the third largest lake in Europe. Iron mines in this län are the richest in Sweden. The surface is mountainous. Capital, Carlstad.

WERNER, ABRAHAM GOTTLIEB, a celebrated mineralogist and geologist, b. at Wehrau, on the Queiss, in Upper Lusatia, Sept. 25, 1750. His father was director of a smelting-work, and he was thus led almost in childhood to the study of minerals. After some time spent at the mineralogical academy of Freyberg, he went to Leipsic, where he studied natural history and jurisprudence. Here, at the age of 24, he published his first work on mineralogy, a mere pamphlet on the external characters of minerals. In 1775 he was appointed professor of mineralogy, and curator of the mineralogical cabinet at Freyberg. In 1780 he published the first part of a translation of Cronstedt's *Mineralogy*, in his notes to which he gave the first outlines of the system which bears his name. In 1791 he published a *Theory of the Formation of Metallic Veins*, which was translated into English and French, and greatly extended his reputation. He was not, however, a voluminous author, but his views were diffused by his pupils, among whom were the most eminent German mineralogists of the time. In 1792 he was appointed councillor of mines in Saxony. He died at Dresden in 1817.

Werner's influence was very great in the promotion both of mineralogy and of geology. In his mineralogical system, minerals were distinguished and arranged chiefly according to their external characters; and mineralogists have now learned to depend much more than he did on their chemical constitution. In geology he did great service by arranging the facts already known, and guiding to proper methods of observation. His theory was extensively received for a time. It may be described as the opposite of the Huttonian theory, accounting for the present state of mineral substances in general by supposing them to have been dissolved or suspended in water; while the Huttonian theory ascribed almost everything to the action of fire. Werner's is sometimes called the Neptunian theory, while that of Hutton is styled the Plutonic. Modern geology recognizes a certain measure of truth in both, but rejects them alike in that character of completeness or universality in which they were once advocated. Werner classified rocks into primary, transition, and secondary; and the terms are still sometimes used, although merely as convenient names, not as indicative of opinions concerning the rocks designated by them.

WERNER, FRIEDRICH LUDWIG ZACHARIAS, 1768–1823; b. Königsberg, Germany; studied law in that city, and in 1793 entered the Prussian civil service, holding office for twelve years in Warsaw and for two years in Berlin. In this time he produced four dramas, the most important being *Der 24te Februar*, which shows a vivid imagination and considerable dramatic power. In 1809 he went to Rome, and two years later joined the Roman Catholic church. In 1814 he became a priest, preached in Vienna and elsewhere, making a great sensation by his peculiar eloquence. He remained in Vienna until his death. His collected works were published in 1841, and consist of eight dramas and many poems, hymns, and sermons.

WERNER, KARL, b. Germany, 1808; studied painting in Leipsic and Munich. He went to Rome in 1833, and resided there for the next 20 years. He afterward traveled through Spain and the east. Among his works are: "Venice in her Zenith and

Decline;" "The Lions' Court of the Alhambra;" and "Jerusalem and the Holy Land." His best work is in water-colors.

WERNIGERO DÉ, a small walled t. of Prussia, in the government of Magdeburg, and 43 m. s.w. of the city of that name, stands at the northern base of the Brocken mountain. Its castle, the residence of the counts Stolzberg-Wernigerode, comprises a library of 40,000 volumes, and a zoological garden. It manufactures linen, cloth, and tobacco; and carries on copper-smelting and paper-making. Pop. '75, 7,580.

WESEL, a strongly fortified t. of Prussia, on the Rhine, 32 m. n.n.w. of Düsseldorf. The Rhine, which here is joined by the Lippe, is divided by a fortified island, and crossed by a bridge of boats, protected on the left bank by a fort. Of its churches, the Willibrod Kirche was first opened in 1181. Cloth, hosiery, serge, leather, hats, tobacco, and linen are manufactured, and book-printing is carried on. The citadel is defended by about 4,500 men. Pop. '75, inclusive of garrison, 19,096.

WESER (Lat. *Visurgis*), a river of Germany, formed out of the Werra, which rises in the Thüringer-wald, and the Fulda, rising in the Rhöngelberge, on the frontiers of Prussia and Bavaria. These streams, after a northern course, unite at Münden, in Hanover; and the united stream, the Weser, flows n. through Prussia, till, passing Bremen, it forms for about 40 m. the boundary between Oldenburg and Prussia, and enters the North sea by a wide but shallow estuary, much interrupted by sand. Entire length, 260 miles. It communicates with the Elbe by a navigable canal; but though considerably improved in this respect, the Weser is not of much use as a navigable stream. The principal trading town on its banks is Bremen.

WESLEY, JOHN, the founder of the Methodists (q.v.), was born at Epworth, in Lincolnshire, England, June 17, 1703. The family name was variously spelled Wesley and Westley, and is supposed to be the same with Wellesley, and to be derived from a place of that name near Wells. An Irish gentleman, Garrett Wellesley, esq., of Dunganon, offered to make Charles Wesley, younger brother of John, his heir, on condition of his settling in Ireland, believing him to be of his own family. The offer was not accepted; and the estate of Mr. Wellesley went to another branch of the family, which was soon raised to the Irish peerage, with the title of earl of Mornington, and from which the duke of Wellington and the marquis of Wellesley sprang. The more immediate progenitors of John Wesley were ministers of the church of England, of Puritan principles. Some of them suffered for non-conformity. Bartholomew Wesley, the great-grandfather of John, was ejected from his living by the act of uniformity in 1662. John Wesley, the son of Bartholomew, was also deprived of his living, and was often fined, and several times imprisoned for preaching contrary to the law. Samuel Wesley, a son of this John Wesley, conformed to the church of England, but opposed the schemes of James II., refusing to be bribed by offers of preferment, which, on account of his erudition and talents, it was thought worth while to make to him. He supported the cause of the revolution, in circumstances of personal danger; and, in the beginning of the reign of William and Mary, was rewarded with the living of Epworth. He wrote an epic poem entitled *The Life of Christ*, and other similar works. He had a family of nineteen children. His wife Susannah Annesley, the daughter of an ejected minister, was a woman of remarkable intelligence and fervent piety, who devoted herself very much to the education, and particularly the religious education, of her children. His eldest son, Samuel, head-master of Tiverton school in Devonshire, was a tory and high-churchman, who strongly disapproved of the "new faith" and peculiar course of his brothers John and Charles. John Wesley was the second son of Samuel, or the second who grew up to manhood. In his infancy he had a narrow escape from being burned to death, when the parsonage of Epworth was burned by some of the parishioners in their rage against their pastor for his faithful reproof of their vices. Another remarkable story is connected with the parsonage of Epworth, and with the early years of John Wesley's life—the continued disturbance of the family throughout a considerable time, by loud knockings and other noises, which could not be accounted for, and which therefore were regarded as preternatural, although Mr. Wesley and his household were less affected by the strange visitation than perhaps its authors expected them to be, and persisted in residing in the parsonage, even making sport of "Old Jeffery," their unseen visitant, who "was plainly a Jacobite goblin, and seldom suffered Mr. Wesley to pray for the king and the prince of Wales without disturbing the family prayers."

John Wesley was a very diligent and successful student. The religious history of his college life belongs to the history of Methodism (q.v.). After much conscientious hesitation as to his motives and fitness for entering into the clerical profession, he was ordained deacon in 1725, and in 1726 he graduated as M.A., and was elected fellow of Lincoln college, Oxford. In the same year he was appointed Greek lecturer and moderator of the classes. He became curate to his father at Wroote, a small living which Samuel Wesley held along with that of Epworth, and while serving here, he was advanced to priest's orders in 1728. He returned to Oxford, and along with his younger brother, Charles, entered into those religious associations from which Methodism sprang. The intercourse of the brothers Wesley at this time with William Law, the author of the *Serious Call*, had a great influence on their opinions and conduct. They walked two or

three times a year from Oxford to visit Law at his house near London. In 1735, John Wesley was induced to go out to Georgia with general Oglethorpe, to preach to the Indians and colonists. His religious views at this time were strongly tinged with asceticism. His intercourse with Moravians, who were his fellow passengers to America, and afterward his fellow-laborers in the colony, tended to stimulate his religious zeal. He attempted to establish a discipline in the colony, very different from that of the church of England at home, and failed in the attempt. The difficulties of his position were increased by an affair in which he became involved with the daughter of the chief magistrate of Savannah, whom he wished to marry; but on the advice of the Moravian bishop and elders, to whom he submitted the matter, he withdrew from her, and she very soon marrying another, Wesley refused her admission to the communion; upon which her husband raised an action at law, and Wesley, finding Savannah no suitable place for him, and, as he said, "shaking the dust off his feet," returned to England, having resided in America not quite two years. With religious zeal undiminished, he maintained an intimate connection with the Moravians in London. On May 24, 1738, some months after his return to England, he attended a meeting of a society in Aldersgate street, where, while one was reading Luther's Preface to the Epistle to the Romans, he experienced such a change of religious feeling that, notwithstanding all his previous zeal, he ever afterward regarded this as the time of his conversion. "I felt my heart strangely warmed," he says: "I felt I did trust in Christ, Christ alone, for salvation; and an assurance was given me, that he had taken away *my* sins, even *mine*, and saved me from the law of sin and death." Many who accept generally Wesley's views of conversion, doubt his opinion as to the date of his own. After this he visited the Moravian brethren at Herrnhut in Germany, made the acquaintance of Zinzendorf, and was introduced to the prince royal of Prussia, afterward Frederick the great. Returning to England, he became associated with his old college companion, Whitefield, and after his example began, in 1739, the practice of open-air preaching. From this time, the history of Wesley's life becomes very much the history of Methodism. In 1740, he solemnly separated himself from the Moravians, finding that he differed from them in important points of doctrine; and in the same year the breach took place between Whitefield and him, which divided the Methodists into two sections, Calvinistic and Arminian. In the evangelistic work which he carried on in England, and in organizing the Methodist body, Wesley was indefatigable. He seldom traveled less than forty miles a day, usually on horseback, till near the close of his life, when he used a chaise. In 1752, he married a widow with four children, but the marriage proved an unhappy one, and a separation ensued. His health gradually declined during the last three years of his life, and after a short illness, he died in London, Mar. 2, 1791, in the 88th year of his age. His remains lay in state for several days in his chapel in the City road, dressed in the sacerdotal robes which he usually wore, with a Bible in his hand. Wesley was a voluminous writer. His writings are chiefly polemical and religious. His style in the pulpit was fluent, clear, and argumentative, not impassioned like Whitefield's; his countenance was mild and grave; and his manners agreeable, although he exercised a very imperial domination over the preachers of the Methodist body. He was a man of great benevolence, and gave away all his living to the poor. Probably no man ever exerted so great an influence on the religious condition of the people of England as John Wesley, and his influence has extended to the most remote parts of the world.—CHARLES WESLEY, his younger brother, b. at Epworth, Dec. 18, 1708, was associated with him in the whole Methodist movement. Having studied at Christ church, Oxford, and visited Georgia at the same time with his brother, he took an active part in the subsequent work in England. He was a clear and simple preacher, and a man of fervent piety, but of a disposition very far removed from asceticism. He is the author of a great number of hymns in use among the Methodists; some of which, however, are among the best and most admired hymns in the English language, replete with pious feeling, and of lyrical power and sweetness almost unsurpassed.—See *The Works of the Rev. John Wesley* (16 vols. Lond. 1809); *Life of the Rev. John Wesley, A.M.*, by Dr. Coke and Mr. Moore (Lond. 1792); *The Life of Wesley*, by Southey (2 vols. 1820; new ed. 1864); *The Life and Times of Wesley*, by Tyerman (1876); and *John Wesley and the Evangelical Reaction*, by Miss Wedgwood (1876).

WESLEY, or WESTLEY, SAMUEL, 1664-1735; b. England; was designed by his father, the rev. John Westley, for the dissenting ministry, but early entered the church of England; studied at Oxford, supporting himself by teaching; was curate for a year in London, and the following year chaplain on board a man-of-war. He was subsequently curate for two years in London, and after the revolution was presented with the living of Epworth, Lincolnshire. He was the father of the renowned John Wesley, the founder of the denomination called Methodists. He published *The Life of Christ*, a heroic poem; *Eligies on Queen Mary and Archbishop Tillotson*; *History of the New Testament attempted in verse*; *History of the Old Testament*; a poem on the battle of Blenheim; a *Latin Commentary on the Book of Job*; a *Treatise on the Sacrament*.

WESLEYAN METHODIST CONNECTION OF AMERICA grew out of a separation from the M.E. church, the result of the connection of that church with slavery, and the arbitrary character of its government. The revs. Orange Scott, J. Horton, and

Le Roy Sunderland withdrew in Nov., 1842, beginning at the same time the publication of a weekly paper, *The True Wesleyan*. In December following a number of other ministers also withdrew. Secessions of churches and ministers also took place in different northern states; the most extensive being in Michigan, where a conference was organized. A number of ministers and members also seceded from the Methodist Protestant church. The first local Wesleyan church was organized in Providence, R. I., in 1842.

In Feb., 1843, a convention of the seceders was held in Andover, Mass., where a basis of organization was partially agreed upon. This resulted in a call for a general convention, which was held in Utica, N. Y., commencing May 31, 1843. A form of church government was agreed upon, a "discipline" adopted, and about 3,000 members reported. The first general conference was held in Oct., 1844; the discipline was carefully revised, and the principles of the church clearly defined. About 6,000 members were reported. One great obstacle in the way of success at first was the want of church buildings. Societies were small, and generally far apart. They met with much opposition, but churches and parsonages were erected as fast as possible.

In 1866 several prominent ministers attempted to form a union with the Methodist Protestant church. But the discipline of the Wesleyans laid down certain principles of civil government, and required its members to vote in accordance with these principles—that the republic is a nation, that equal rights are to be accorded to all its citizens, and that all laws should conform to the Bible, the rule of practice for nations as well as individuals. The discipline also excluded from church-fellowship all members of secret societies. For the love of these principles the great body of the church refused to go into the union movement. The leaders, however, carried into the union a number of churches, with Adrian college in Michigan, and leaving the Book Concern at Syracuse, N. Y., practically bankrupt. The denomination seemed on the verge of extinction; but under the efforts of the rev. Adam Crooks, who was appointed publishing agent and editor, the claims against the Book Concern were paid off in a few years. He also raised by subscription some \$25,000 toward the erection of a new publishing house. In 1874, in the midst of his arduous labors, he was suddenly removed by death. Rev. D. S. Kinney was appointed his successor, and has been equally successful. He has raised additional funds, and in 1879 completed the new publishing house at Syracuse, a fine four-story brick building, at a cost of \$35,000.

In 1879 some thirty changes were made in the discipline. The distinctive features of the connection are these. In doctrine they follow John Wesley; in government they are half-way between Presbyterianism and Congregationalism; in regard to civil government, they hold that God is the governor of nations, and that the sovereignty of Jehovah, and the supreme authority of his revealed will, should be acknowledged by the constitutions of states and nations. Wesleyan Methodists oppose all kinds of oppression and monopoly, and exclude from their fellowship all members of secret societies. Their educational interests center in a flourishing institution of learning at Waseja, Minn. At Syracuse, N. Y., they have publishing interests to the value of \$65,000. They publish there the *American Wesleyan*, a weekly eight-page paper, the *Children's Banner*, semi-monthly, and the *Bible Standard*, a monthly magazine. They have nineteen yearly conferences, in which are 400 ministers, and 25,000 members; churches and parsonages to the value of \$600,000.

WESLEYAN UNIVERSITY, in Middletown, Conn., founded by the Methodists, 1830, the oldest college of that denomination in the country. It has an endowment of \$300,000, and annual income of \$35,000. The buildings are the North and South colleges, Memorial hall, Rich hall, and Judd hall, all of brown stone; Observatory hall, of brick, and the gymnasium. These buildings, most of which front an ample and well-shaded campus overlooking the Connecticut valley and the surrounding country, are with the grounds estimated to be worth \$400,000. The library contains nearly 30,000 vols., and has an invested fund of \$20,000 to secure its increase. The patronage of the institution is derived mainly from thirteen annual conferences of the M. E. church, each one of which chooses a member of the board of trustees. There are three courses of study of four years each: 1. The classical course, substantially that of the other New England colleges; 2. the Latin-scientific course; 3. the scientific course. The last two are designed particularly for advanced culture in science and modern languages and literature. In these departments half the work of the last two years is elective. Post-graduate courses are also provided. The laboratories are extensive and well-furnished. They are used for chemical experiments by the state agricultural station established in Middletown, and are under the control of a chemist paid by the state. The university, since 1872, has been open to students of both sexes. In 1878 it had 17 professors and 163 students; alumni, 1100. Cyrus Foss, D.D., president since 1875, was appointed a bishop in 1880. John Wesley Beach, D.D., is president, and professor of moral philosophy.

WESSEL, JOHANN, called also *Gansfort*, a predecessor of Luther, was b. at Gröningen, 1419, taught philosophy at Cologne, Louvain, Heidelberg, and Paris, and died (1489) in his native town. On account of his learning, he was called *Lux Mundi* (light of the world); while his enemies, on account of his opposition to the scholastic philosophy, termed him *Magister Contradictionum* (master of contradictions). In his doctrine of justification by faith, he forestalled Luther, who esteemed him very highly. After his

death, a large portion of his writings were burned as heretical. Another portion appeared under the title of *Farrago Rerum Theologicarum*, of which Luther published an edition with a preface (Wittenb. 1522), but the most complete edition is that by Joh. Lydius (Amst. 1617). See Ullmann's *Joh. Wessel, ein Vorgänger Luther's* (Hamb. 1834), and Bähring's *Das Leben Joh. Wessels* (Bielef. 1846).

WESSEX. See HERTARCHY.

WEST, BENJAMIN, Anglo-American painter, was b. at Springfield, Penn., Oct. 10, 1738, of Quaker parentage, and with lack of opportunity or encouragement, surprised his friends by his skill in drawing at the age of seven years, and at nine painted a picture in water-colors, which, in some points, he declared in after-life, he had never surpassed. His first colors were made from leaves, berries, etc., and his brushes stolen from a cat's tail. Thus self-taught, at the age of 16 he practiced portrait-painting in the villages near Philadelphia, and painted for a gunsmith his first historical picture, "The Death of Socrates." While the society of Friends were discussing the propriety of his becoming a painter, he snocked their principles still more by volunteering in a military expedition in search for the remains of Braddock's army. At 18, he was painting portraits in Philadelphia, and later at New York, where, in 1760, he was aided by some generous merchants to go and pursue his studies in Italy. At Rome, he was patronized by lord Grantham, whose portrait he painted, became the friend of Mengs, and, as the first American artist ever seen in Italy, attracted much attention. He painted his "Cimon and Iphigenia," and "Angelica and Medora," and was elected member of the academies of Florence, Bologna, and Parma. In 1763, visiting England on his way to America, he was induced to remain in London, and in 1765 married Eliza Shewell, to whom he had been engaged before leaving America. His "Agrippina landing with the ashes of Germanicus," attracted the attention of George III., who was his steady friend and patron for forty years, during which time he sketched or painted 400 pictures. His "Death of Gen. Wolfe," painted in the costume of the period, against the advice of all the most distinguished painters, effected a revolution in historic art. For the king, he painted a series of 28 religious pictures for Windsor castle. His best-known works are "Christ healing the Sick," "Death on the Pale Horse," and the "Battle of La Hague." In 1792 he succeeded sir Joshua Reynolds as the president of the Royal academy, but declined the honor of knighthood. Through his whole career he was the generous friend, adviser, and patron of young artists. *The Life and Studies of Benjamin West* were compiled from materials furnished by himself, by John Galt, in two parts (Lond. 1816-20); and a biography of him is also given in Cunningham's *Lives of Eminent British Painters*. He died in London, March 11, 1820, and was buried with great pomp at St. Paul's cathedral. His wife died 1817. Two sons survived him.

WEST, NATHANIEL, D.D., 1794-1864; b. Ireland; studied theology with Dr. Chalmers; came to America, 1834; pastor successively of Presbyterian churches at Meadville, Pittsburg, and Philadelphia, Penn.; chaplain of U. S. hospital, West Philadelphia, 1862-64. He published *The Ark of God the Safety of the Nation; Popery the Prop of European Despotism; Complete Analysis of the Holy Bible; The Overturning of Tyrannical Governments*. His topical analysis of the Bible has had, in various forms, a wide circulation.

WEST, SAMUEL, D.D., 1730-1807; b. Mass.; graduated Harvard college, 1754; ordained, 1764; preached at New Bedford several years; engaged actively in politics and wrote for the newspapers; was a member of the state constitutional convention; was a member of the academies of sciences at Philadelphia and Boston. He dissented from Calvinism, and published an *Essay on Liberty and Necessity* in reply to Edwards *On the Will*.

WEST, STEPHEN, D.D., 1735-1819; b. Conn.; graduated Yale college, 1755; taught school at Medford, Mass.; chaplain at Hoosick fort, 1757; missionary to the Stockbridge Indians, as successor of Jonathan Edwards, 1758; pastor of the church, Stockbridge, 1759-70. He published *Essay on Moral Agency; Remarks on Edwards's Inquiry on the Freedom of the Will; Essay on the Scriptural Doctrine of the Atonement; Evidences of the Divinity of Christ*.

WESTALL, RICHARD, 1765-1836; b. England; apprenticed to an engraver, but became a painter. His best works are water-color drawings of classical subjects. His brother WILLIAM, 1781-1850, studied at the Royal academy, and published several works containing views of English and eastern subjects. He went with Flinders on his voyage of discovery in 1781, visiting Asia and Australia, and making many sketches.

WEST BATON ROUGE, a parish in s.e. Louisiana, having the Mississippi river for its e. boundary, the Bayou Fordeche on the w.; 225 sq.m.; pop. '80, 7,667-7,551 of American birth, 5,415 colored. Co. seat, Allain.

WEST BROMWICH, a large and rapidly increasing t. of South Staffordshire, one of the most important towns in the great manufacturing and mining district known as "The Black Country," five m. n.w. of Birmingham. A few years ago West Bromwich was a mere village on a barren heath, and it owes the rapidity of its growth mainly to the rich mines of coal and iron in the vicinity, and to the industries to which these give rise. Very many canals and three railways run through the parish. There are

numerous churches, schools, and other important establishments. There are very large glass-works and also gas-works in the town; much of the gas used in Birmingham, as well as all that supplied to West Bromwich, Wednesbury, and many other towns in the vicinity, being made here. The manufactures of iron-wares of all kinds, as gun and pistol barrels, locks, swords, fire-irons, fenders, etc., and of all kinds of hollow wares, as kettles, sauce-pans, etc., are among the great branches of industry. Pop. '71, 47,981.

WESTBURY, a small and ancient parliamentary borough of Wiltshire, 20 m. n.w. of Salisbury, and on the western declivity of the Salisbury plain. Its church, a tasteful edifice, was erected—the older parts at least—in the 13th century. For the most part uninteresting in itself, Westbury stands in the midst of a locality interesting from its many antiquities. Westbury is a station on the Wiltshire and Somerset railway. Pop. '71, 6,396, chiefly employed in agriculture, the manufacture of woolen cloth of a superior quality, and the smelting of iron ore, some extensive mines of which have lately been discovered near the town, and which afford employment to many hands.

WESTCHESTER, a co. in s.e. New York, having the state line of Connecticut and Long Island sound on the e., bounded on the w. by the Hudson river, drained by the Croton and Bronx; 500 sq.m.; pop. '80, 108,987—85,288 of American birth, 2,617 colored. A part of the s. portion was annexed to New York city in 1873. It is crossed by ridges of hills, and has extensive quarries of marble, and mineral springs. Its agricultural products and manufactures are important. Co. seat, White Plains.

WESTCHESTER, a beautiful t., in a rich agricultural district of Pennsylvania, U. S., 23 m. w. of Philadelphia, with elegant residences, a granite court-house, a white marble bank, 10 churches, an academy, a state normal school, and 2 public libraries. Pop. '70, 5,630.

WESTCOTT, BROOKE FOSS, D.D., b. England, 1825; graduated, Cambridge, 1848, ordained, 1851; assistant master of Harrow school, 1852-69; examining chaplain to the bishop of Peterborough, 1868; canon of Peterborough cathedral, 1869; regius professor of divinity at Cambridge, 1870; honorary chaplain to the queen, 1875. He has published *Elements of Gospel Harmony*; *History of the Canon of the New Testament during the first Four Centuries*; *Characteristics of the Gospel Miracles*; *Introduction to the Study of the Gospels*; *The Bible and the Church*; *The Gospel of the Resurrection*; *History of the English Bible*. He contributed to Smith's *Bible Dictionary*, and is one of the revisers of the New Testament.

WESTERBOTTEN, a län in n. Sweden, on the gulf of Bothnia, adjoining Norway; about 24,000 sq.m.; pop. about 100,000. It is watered by the Umea and other rivers; intersected by ridges of the Kiölen mountains; and contains many lakes. Iron and copper are found. Capital, Umea.

WESTERLY, a t. and village on both sides of the Pawcatuck river, therefore partly in Connecticut and partly in Rhode Island; on the Providence and Stonington railroad; pop. '80, 6,104. It has banks, a public library, a weekly newspaper, a large hotel, etc. Its granite quarries are celebrated, and employ a large force of men. Among the manufactures are cottons and flannels.

WESTERN AUSTRALIA, a British colony, and the western section of the great island-continent of Australia, embraces the whole of that island w. of the 129th meridian. Its extreme length from n.e. to s.w. is 1370, its average breadth is 650 m., and its area is estimated at 978,000 sq.miles. Pop. '76, 27,321. Revenue '77, £165,412; expenditure, £182,159; and public debt, same year, £161,000. This colony was formed in 1829, and in 1851 had only 5,886 inhabitants; but within recent years a considerable number of emigrants have been sent out under the auspices of the government emigration board. Western Australia was formerly named *Swan River Settlement*, from the river Swan, which joins the Indian ocean, after watering a considerable district in the extreme s.-w. Of the whole vast area, this district in the s.w. is now, as formerly, the only portion inhabited. There, mountain ranges rising in elevation from the coast inland, run parallel with each other from s. to n., the highest summit being 5,900 ft. above sea-level. The climate is agreeable and salubrious; the soil, both on the coast and in the interior, is light and dry. Bands of fertile land, where the sandal-wood and other trees grow abundantly, and which are suitable for the culture of the vine, olive, and fig, occur in the middle districts of the country. Rivers, of which the Swan is the chief, abound; but are not of much use for navigation. Magnetic iron ore, lead, copper, and zinc ores are found in large quantities, and a little coal has been found. In 1874, 144 vessels, of 65,351 tons, entered the ports. There is a pearl-fishery on the n.w. coast, producing to the value of £74,000 in 1874. Imports in 1877 (chiefly groceries, beer, ironmongery, and clothing), amounted to £362,706; exports (chiefly wool, sandal-wood, timber, copper-ore, and horses), £373,351. The capital is Perth, and there are several smaller towns. The colony became (1849), at the request of the colonists, a settlement for convicts, and has much benefited by their labor, a great extent of road and many public buildings having been constructed by them. In 1868 the home authorities were, however, persuaded by the Australian colonists finally to discontinue transportation to Western Australia.

WESTERN EMPIRE, that portion of the Roman empire of which Rome was the capital, and which comprised (besides Italy), Gaul, Britain, Spain, Africa, Pannonia, Illyricum, and Dalmatia. The partition was made upon the death of Theodosius in 395. His younger son, Honorius, took the western empire—his eldest son, Arcadius, the eastern, whose capital was Byzantium. See **BYZANTINE EMPIRE**, *ante*. Between 395 and 476—when Romulus Augustus, better known by the name of Augustulus, was deposed by Odoacer—the western empire had 12 emperors, Honorius (d. 423); Joannes, 425; Valentinian III., 455; Maximus, 455; Avitus, 457; Majorian, 461; Severus, 465; Anthemius, 472; Olybrius, 472; Glycerius, 473; Julius Nepos, 474; and Romulus Augustus. Through the whole period, however, the emperors had little power; actual leadership was with the generals of the armies. Province after province was lost. In 418 the Goths established an empire in Gaul and Spain. The Vandals soon afterward overran Sardinia, Sicily, and other portions. Britain was given up in 451. Dalmatia and Gaul were seized within the next 20 years by Marcellinus and Ægidius respectively; and Rome was almost the only part of the western empire left in 476.

WESTER NORRLAND, a län or province in e. central Sweden, on the gulf of Bothnia; 9,515 sq. m.; pop. '74, 143,614. The province is traversed by the Adals, Indals, and Angerman rivers and is moderately fertile. Capital, Hernösand.

WEST FELICIANA, a parish in s.e. Louisiana, having the state line of Mississippi for its n. boundary, Thompson's creek on the e., and the Mississippi river on the s. and w.; 359 sq. m.; pop. '80, 12,809—12,646 of American birth, 10,539 colored. Co. seat, St. Francisville.

WESTFIELD, a t. in Hampden co., Mass., on Westfield river, and at the junction of the New Haven and Northampton, and the Boston and Albany railroads; 15 m. s.w. of Northampton and 10 m. w. of Springfield; pop. '80, 7,587. The town is pleasantly situated in a fertile valley, and is a manufacturing place of some importance. There are large tobacco and cigar factories, which consume a large part of the tobacco product of the Connecticut valley. The American whip company is one of the largest firms of the kind in the world. Other manufactures are writing and wrapping paper, and the heavy paper material used for making boats, boxes, belting and other articles; also, church organs, steam-heaters, furniture, etc. There are 4 banks, 2 hotels, 2 newspapers, a public library of 9,000 vols., a high school and 9 churches. The Massachusetts state normal school is here.

WESTFIELD, a city on Chautauqua creek, in Chautauqua co., New York, on the Lake Shore and Michigan Southern railroad, near lake Erie; pop. about 3,000. It has a newspaper, water-works, gas-works, flour-mills, etc.

WEST INDIES are already described under Antilles (q. v.). See also the names of the islands themselves—Jamaica, Cuba, Martinique, etc.; as well as the European countries that possess them—Great Britain, Spain, France, Netherlands, etc.

WEST LOTHIAN. See **LINLITHGOW**, *ante*.

WESTMACOTT, Sir RICHARD, R.A., an eminent sculptor, the son of Richard Westmacott, also a sculptor in his day of some little note, was b. in London in 1775. His predilection for art was early manifested, and was carefully cherished by his father. He received as a youth the best education which London could then furnish, and in 1793 he proceeded to Rome to complete his studies. Here he became in some sort a pupil of the celebrated Canova, who showed him much kindness and attention. His progress was rapid, and he distinguished himself by carrying off the highest prizes offered to the competition of the rising geniuses of the day, in particular a gold medal given by the pope. In 1797, having, meantime, in recognition of his talent and promise, been elected a member of the academy of Florence, he returned to London, where, shortly after, he was married to a daughter of a Dr. Wilkinson, then of some medical celebrity. His success in his art was not for a moment doubtful, and very soon he found himself in full employment. In 1805 he was elected an associate of the royal academy; in 1816 he was advanced to the full dignity of academicien; and in 1835 the university of Oxford recognized his eminence by conferring upon him the honorary degree of D.C.L. Two years afterward, the honor of knighthood was bestowed upon him. Previously in 1827, he had succeeded Flaxman as professor of sculpture at the academy, in which capacity he continued to officiate till his death, which took place on Sept. 1, 1856. The works of Sir Richard Westmacott by which he is chiefly known are public monumental statues, in some of which he had much success. Of these it may suffice to mention his statues in Westminster abbey of Pitt, Fox, Percival, and Addison, with the monuments to Sir Ralph Abercromby and Lord Collingwood in St. Paul's cathedral. Many of his works in the antique classical manner are also of exquisite beauty and finish.

WESTMACOTT, RICHARD, R.A., son of the foregoing, was b. in London in 1799. After being carefully educated under his father in the art which might seem to run in the family blood, he was sent to Rome in 1820 to prosecute his studies further. In Italy he passed six years; and after his return to London, he gradually won a reputation for himself as one of the ablest sculptors of the day. Besides being eminent in his art, he likewise made himself known as a man of considerable literary and general attainment; and in 1837 he had the honor to be elected a fellow of the royal society. In the

year following, the academy recognized his more special claims by assuming him as an associate; and in 1849 he attained the rank of royal academician. On the death of his father, he was appointed to succeed him in the professorship of sculpture, a post which he filled with distinguished ability and acceptance. He died in 1872.

WESTMANLAND, a län in s.e. Sweden, about 2,500 sq.m.; pop. about 125,000. The surface is mountainous. Iron, copper, and silver are mined. Capital, Westeras.

WESTMEATH, an inland co. of the province of Leinster, Ireland, bounded on the n. by the counties of Cavan and Meath, on the e. by Meath, on the s. by the King's county, and on the w. by Roscommon. It lies between n. lat. 53° 8' and 53° 48'; and w. long. 6° 54' and 7° 55'. Its greatest length, n. and s., is 35 m., and the greatest breadth is 25 m.; the total area being 708 m., or 453,468 acres, of which 365,218 are arable, 56,292 uncultivated, 8,803 in plantations, 628 in towns, and 22,427 under water. The pop. in 1851 was 111,109; in '61, 90,879; in '71, 78,432, of whom 71,765 were Catholics, 5,997 Protestant Episcopalians, and the rest Protestants of other denominations. The surface is for the most part level, the billy district, which is in the n. of the county, not reaching at any point a higher elevation than 710 feet. Nevertheless, owing to the number of lakes, and the large extent of wood in some districts, the scenery is in many places highly picturesque. Geologically, Westmeath belongs to the great central limestone series; yellow sandstone only occurring in two very limited districts. Of the numerous lakes which diversify the surface, one chain belongs to the basin of the Shannon, which river, with its lakes, forms the western boundary, and separates Westmeath from Roscommon; the other, toward the e., flows into the basin of the Boyne. The Shannon is navigable for steamboats throughout that portion of its course which bounds this county; and the inland navigation is further provided for by the Royal canal, which traverses Westmeath from e. to w., and by a branch of the Grand canal. The county is also traversed by the Midland and Great Western railway. The climate is mild and not very moist. The soil is a deep loam, producing herbage especially suited to the fattening of cattle, which are largely fed; sheep also are fed, but not in the same proportion, as are also horses and pigs. There is little tillage, and almost the only cereal crop is oats. The total acreage under crops of all kinds in 1878 was 93,409, oats being the chief crop; but scarcely a fourth part of the county is under crops, much of the area being lake and bog, and a great deal of the arable land having gone out of cultivation during the last twenty years. In addition to weekly markets, upward of 70 fairs are held at different seasons of the year throughout the county. The net annual value of property under the valuation act is £314,701. Westmeath is divided into twelve baronies. The chief towns are the assize town and capital, Mullingar (q.v.), Moate, and Athlone, which is partly in the county of Roscommon. It returns three members to the imperial parliament, two for the county and one for the borough of Athlone. The constituency in 1875-76 numbered 3,552. The number of pupils at the national schools in 1877 was 14,275. Westmeath anciently formed a portion of the kingdom of Meath (q.v.), but in the 34th of Henry VIII. it was erected into a separate county, and at first included Longford (q.v.) and part of the King's county (q.v.). Many antiquities of the Anglo-Norman period, and some of the Celtic, chiefly tumuli and raths, are found in this interesting and picturesque county.

WEST MERIDEN, a village in Meriden, Conn. It is the business center, containing the station on the New York, New Haven and Springfield railroad. The population of the entire town, '80, is 18,830. See **MERIDEN**.

WESTMINSTER, THE CITY AND LIBERTY OF, now forms part of the English metropolis. It is bounded by Temple bar on the e., the Thames on the s., Chelsea and Kensington on the w., and Marylebone on the north. The early history of Westminster is that of the abbey, still the most interesting of its public buildings. In early times, that part of Westminster which adjoins the Thames was surrounded by a branch of the river, so as to form an island called Thorney island, from its being covered with brush-wood. Here, on the site of the present abbey, Sebert, king of the East-Saxons, is said, in the 7th c., to have built a church. It is supposed to have been replaced by an abbey called Westminster, to distinguish it from the cathedral church of St. Paul's, called, originally, Eastminster. The first edifice erected on the site of which we have any certain account was one built of stone by Edward the confessor in 1065. The Pyx house, a low apartment, 110 ft. long by 30 ft. wide, vaulted and divided by a certain range of eight plain pillars with simple capitals, is nearly all that remains of it. The principal parts of the existing abbey were built by Henry III. In 1220 he erected a chapel dedicated to the virgin, and a quarter of a century later he took down the old abbey of the confessor, and erected the existing choir and transepts, and the chapel of Edward the confessor. The remainder of the building was completed under the abbots, the western parts of the nave and aisles having been erected between 1340 and 1483. The w. front and its great window were the work of Richard III. and Henry VII. The latter pulled down the chapel to the virgin, erected by Henry III. at the e. end of the church, and built the chapel known as Henry VII.'s chapel. This completed the interior of the abbey as it now stands; the only important addition made since then having been the upper parts of the two western towers, which were the work of sir Christopher Wren. The whole building forms a cross. Its extreme length, including Henry VII.'s chapel, is 511 ft.; its width

across the transepts is 203 feet. The width of the nave and aisles is 79 ft.; of the choir, 38 ft.; and of Henry VII.'s chapel, 70 feet. The height of the roof is 102 ft., a loftiness unusual in English churches. It is the interior of the abbey which has at all times excited the most enthusiastic admiration. The harmony of its proportions, and the "dim religious light" of the lofty and long-drawn aisles, leave on the mind impressions of grandeur and solemnity which churches of greater size fail to produce. The abbey was at one time the burying-place of the English kings, and it has become a national honor to be interred within its walls. It is crowded with tombs and monuments. The chapel of Edward the confessor, at the e. end of the choir, contains his shrine erected by Henry III., the altar-tombs of Edward I., Henry III., Henry V., and Edward III. The canopy of that last mentioned deserves especial notice. It is considered to be one of the greatest works in wood extant, and equal to anything in the best age of mediæval art. Against the altar-screen in this part of the church stand the two coronation chairs. One, the king's chair, incloses the stone brought by Edward I. from Scone, on which the Scotch kings were crowned. The other, the consort's chair, was constructed for the coronation of Mary, wife of William III. Both are still used for coronations. Most of the English kings, from the time of Henry VII. down to that of George III., were buried in Henry VII.'s chapel, and there accordingly are the tombs of queen Elizabeth and Mary queen of Scots. The most remarkable monuments in other parts of the church are those in the e. aisle of the southern transept, known as "poets' corner," where many of the most eminent British poets have been buried. There, monuments are erected to Chaucer, Beaumont, Drayton, Cowley, Dryden, Milton, Gray, Prior, Shakespeare, Thomson, Gay, Goldsmith, Addison, and Ben Jonson. In the n. transept are the monuments of Pitt, Fox, Chatham, Canning, and Wilberforce. Elsewhere are the monuments of the great engineers and inventors—Telford, Watt, and Stephenson.

Since dean Stanley (q.v.) became connected with the abbey in 1864, much has been done to restore and improve the interior, and services conducted in it have attracted much public interest; more especially the anniversary of the foundation, celebrated on Dec. 28, 1865, and the mission sermon delivered by prof. Max Müller on Dec. 3, 1873, when the dean of an abbey asserted his right to allow a layman to preach there.

South of the abbey are the Pyx house, chapter-house—since 1866 restored under the direction of sir Gilbert Scott—cloisters, and the building occupied by Westminster school, formerly the monks' dormitory, etc. Westminster school was founded by queen Elizabeth for the education of 40 boys known as queen's scholars, who are prepared for the universities. Other persons send their sons to it, and it has long been one of the leading English public schools.

The city of Westminster sprang up round the abbey, and the English kings, in consequence of the jealousy with which they regarded the privileges claimed by the citizens of London, early took up their abode there. Before Edward the confessor began to build his new church at Westminster, the residences of the English kings had been the Roman fortress in London, or the Saxon city of Winchester. The king, to superintend the building of the church, took up his abode in the palace. William Rufus, in 1097, erected a palace between the abbey and the Thames. Its chief apartment was a banquetting hall, which, becoming ruinous in the time of Richard II., he pulled down, and erected in 1397-99, on the same site, and indeed on the same foundations, the great hall which still exists. It is 90 ft. high, and 290 ft. long, by 68 ft. wide internally, and is roofed by 13 great ribs of timber, combined with a mechanical skill which has not been excelled in any work of the present age. The roof of Westminster hall is the finest specimen of the purely English art of forming a Gothic roof of wood: with the exception, perhaps, of the hall of justice at Padua, it is the largest roof in Europe unsupported by pillars. The law courts were established at the hall in 1224, and they continue to be held in buildings which rest on the northern side of the building, and open into it by side-doors. These law-courts, as an excrescence and out of place, are to be removed to the new buildings now being erected near Lincoln's Inn Fields.

The old houses of parliament which adjoined the hall, and like it lay between the abbey and the Thames, were burned to the ground in 1834. It was then determined to erect a new building on the same site, but on a much grander scale. The designs of sir Charles Barry for "the new palace of Westminster" were selected as the best, and the work was begun in 1840. The building is the most magnificent erected in this country for many centuries. It may be roughly said to form a parallelogram, 900 ft. long by 300 ft. in width. The principal rooms are the house of lords and the house of commons, which occupy the center of the building, and run on the line of its greatest length. They are separated by an "octagon hall," with a diameter of 70 ft. between the walls. From this hall, one corridor runs n. to the house of commons, and another s. to the house of lords, beyond which are the royal apartments at the extreme s. of the building. The entrance to the "octagon hall" is by a passage known as St. Stephen's hall, which communicates by flights of steps with an entrance in the e. front, and also with Westminster hall, which, included in the new building, forms its northern vestibule. The state entrance of the queen is at the south-western extremity, and is, of course, in direct communication with the royal apartments. The building is surmounted by lofty spires and towers. In the center, above the octagon hall, rises the central tower, 300 ft. high. At each corner there are towers; at the s.w. the Victoria tower, 346 ft. high; at the n.w. the

clock-tower, surmounted by a belfry spire 320 ft. high. The clock has 4 faces, each 30 ft. in diameter; and it strikes the hours on a bell weighing 9 tons, and known as Big Ben. The appearance of the eastern front is still marred by the buildings occupied as law courts, and it is believed that, on their removal, the picturesque outline of the palace, seen from the n.e., will for the first time prove all the merit of the architect's designs. The chief subject of regret in connection with the edifice is, that the stone of which it was built, a magnesian limestone from Yorkshire, has rapidly decayed, and that it has, in consequence, been found impossible to protect the rich ornaments of the exterior from the influence of the atmosphere. Many public improvements have been carried out recently in Westminster, the chief being the construction of the Thames embankment, opened July 13, 1870, which forms a broad and magnificent thoroughfare between the houses of parliament and Somerset house; and the erection of the Indian and foreign offices at the eastern extremity of St. James's park, and thrown open to parliament in December, 1873. See *Historical Memorials of Westminster Abbey* (3d edition, Lond., 1869); *Dedication of Westminster Abbey*, by Dean Stanley; *The Memorials of Westminster*, by rev. Mackenzie E. C. Walcott (1851).

WESTMINSTER. HUGH LUTPS GROSVENOR, Duke of, b. London, 1825; son of Richard, second marquis; succeeded to the marquise in 1869, and was created duke in 1874. He was a member of parliament for Chester, 1847-69, and is a member of the liberal party. He is generally supposed to be the wealthiest man in England.

WESTMINSTER ASSEMBLY OF DIVINES and **WESTMINSTER STANDARDS.** See **CREEDS AND CONFESSIONS**, *ante*.

WESTMORELAND, a co. in s.w. Pennsylvania, having the Alleghany river for its n.w. boundary, the Conemaugh and Kiskiminetas rivers on the n. and n.e., the Pennsylvania canal on the n. border, drained by the Youghiogheny and other streams; 1040 sq.m.; pop. '80, 78,129—71,550 of American birth, 669 colored. Co. seat, Greensburg.

WESTMORELAND, a co. in e. Virginia, having the Potomac river on the e. separating it from Maryland, the Rappahannock river on the w., the birthplace of Washington, James Monroe, and Richard Henry Lee; 316 sq.m.; pop. '80, 8,846—8,817 of American birth, 5,100 colored. Co. seat, Montross.

WESTMORELAND, a co. in s.e. New Brunswick, dominion of Canada, bounded by the strait of Northumberland and the bay of Fundy; 1284 sq.m.; pop. '71, 29,335. The Petitcodiac river forms part of its s.w. boundary. Co. seat, Dorchester.

WESTMORELAND, a co. in the n.w. of England, bounded on the e. by Yorkshire, on the s. and w. by Lancashire, and on the n. by Cumberland and Durham. Area, 500,906 acres, of which in 1878 there were less than 50,000 acres in corn and green crops, clover, etc.; while over 196,000 were in pasture. Tillage is mostly confined to the valleys. There is some lead mining; the manufactures of Westmoreland are unimportant. Pop. '71, 65,005. The surface is almost wholly mountainous, the chief summit being Helvellyn (3,055 ft.) partly in Cumberland. The other more important summits are Loughrigg fell, Bowfell, Crossfell, and High street and Langdale pikes. Lakes remarkable for their beauty occur. The chief are Windermere (q.v.), partly belonging to Lancashire; and Ullswater (q.v.), between Westmoreland and Cumberland. Moorlands are numerous and extensive; but along the courses of the Kent in the s., and the Eden in the n.—the principal streams—there are tracts of fertile land. The climate is mild and moist, often with much snow in winter, the deep wreaths of which frequently prove fatal to travelers on the mountain tracks. The soil is mostly a dry gravelly mold, favorable to the culture of turnips, of which great crops are produced. Rich pasture-land abound, and cattle, mostly of a large size, are extensively reared. The county town is Appleby, and the other chief towns are Ambleside, Kendal, and Kirkby-Lonsdale. The county returns two members to parliament.

WESTON, THOMAS, b. England, in the last quarter of the 16th c.; a London merchant, who advanced £500 for the *Mayflower* in 1620. Two years later he began a settlement of his own at Wessagussett (Weymouth), coming over himself. His colonists proved to be a thriftless set, most of them went to Plymouth, and Weston himself soon returned to England.

WESTPHALIA, a province of Prussia, lies between Holland, Hanover, Brunswick, Hessen-Nassau, and the Rhine province. Its area is 7,770 English sq.m.; with a pop. '75, of 1,907,195, who, with the exception of about 18,000 Jews, are of the purest German descent. Of the population 949,118 were, in 1871, Catholics, and 806,464 Protestants. Westphalia is divided into three districts—Münster in the n.w., Minder in the n.e., and Arnsberg in the south. The e. of the province presents vast plains covered with grain, while the n.w. exhibits an uninterruptedly flat expanse of uncultivated land. The climate is generally temperate. The chief rivers are the Weser (q.v.), the Ems, the Lippe, and the Roar, or Ruhr, each of which is navigable for a considerable part of its course. The prosperity of Westphalia is chiefly due to its flax crops and its mineral treasures, especially coal and iron. The chief of the industrial products are iron, and articles of iron, steel, and copper from the forges of Arnsberg; while manufacturing industry embraces flax-spinning and linen-weaving in Minden, and extensive production of woollen articles, stockings, and ribbons of esteemed quality. The exports consist of these products, and of

meat, especially hams. The capital, Münster (q.v.), had, till 1818, a university, now a higher academy, and is the seat of the supreme Catholic and Protestant religious authorities.—Westphalia derives its name from the Westfalen, a section of the great Saxon people, who migrated hither from the banks of the Elbe soon after the Christian era; and after the subjugation of the Saxons by Charlemagne, the deposed leader, Wittekind, was allowed to remain *duke of the Engern and Westfalen*. At this time, the country called Westphalia (and occasionally denominated *Sauerland*) comprised all Germany between the Weser, Rhein, and Ems; and soon after, it was subjugated by the dukes of lower Saxony, and held by them till, on the rebellion of Henry the Lion in 1179, the electoral archbishop of Cologne extended his sway over it. It then became one of the circles of the empire, and belonged to the Cologne electorate till 1802, when most of it was given to the Hesse-Darmstadt family. In 1807 arose the *kingdom of Westphalia*, which, besides a portion of Westphalia, also included electoral Hesse, Hanover, Brunswick, and portions of upper Saxony. This kingdom, erected by Napoleon as a preliminary to its incorporation into France, was given to his youngest brother, Jerome, who made Cassel his capital, and, despite the large French garrisons with which the country was burdened, and the extensive contributions in men and money which it was forced to pay to Napoleon, succeeded, by the establishment of the code Napoleon, and by showing in various other ways his strong desire to promote the welfare of his new subjects, in acquiring their esteem. But the oppressive conscriptions and taxes for the behoof of the French army and treasury gradually increased in amount, and excited such resentment, that Jerome's life was several times threatened. The king repeatedly remonstrated with Napoleon, but without the slightest effect; and despite his efforts, the "continental system" was introduced into his states. In 1813 Jerome was chased from Cassel by the Russians; and though he returned for a few days, the defeat of Leipsic forced him to take shelter in France. By the treaty of Vienna, the states which had been joined to Westphalia to form the kingdom, were restored to their former possessors, and Westphalia itself, with the exception of a portion which had been annexed to Hesse-Darmstadt, was united to Prussia.

WESTPHALIA, TREATY OF, also known as the *treaty of Münster*, was concluded at Münster and Osnabruck (towns in the circle of Westphalia) in 1648, and in putting an end to the thirty years' war (q.v.), restored tranquillity to Germany, established a new system of political equilibrium in Europe, and became the basis of all subsequent treaties down, till the French revolution. The minor states of Germany had long desired a cessation of hostilities; and as early as 1638 plenipotentiaries from France, Sweden, and the empire had assembled at Hamburg; but it was not till several years after, that all parties agreed to Münster and Osnabruck as the places and to Mar. 26, 1642, as the time of meeting of the congresses. Ferdinand, however, was very loath to commit himself to a definite negotiation till the success of his arms, the hope of succor from Spain, or a change in the French policy, should give him less the position of a beaten opponent willing to accept almost any terms; and he accordingly temporized from time to time till his hopes of succor had vanished. In 1644, the congresses opened, the two places of meeting having been chosen to avoid any rivalry between France and Sweden for supremacy, to prevent any collision between the Swedish representatives and the pope, and to separate the Catholics from the Protestants. The representatives of France, the empire, Spain, and the Catholics of Germany, met at Münster under the mediation of the pope, and those of Sweden, the empire, and the Protestants of Germany, under the mediation of the king of Denmark; the representatives of Spain, Portugal, the United Provinces, Savoy, Tuscany, Lorraine, Mantua, and Switzerland being also present; so that this congress included all the great European powers except Britain, and almost all the minor powers. As the conflict was still carried on with undiminished vigor, the inclination of fortune to one side was the signal for excessive demands, which were met on the other side by evasive proposals; and it was not till Torstensohn's decisive campaign of 1644-45 that negotiations commenced in earnest, and the representatives made specific propositions. The successes of Turenne and Wrangel, in southern Germany, and the capture of Prague by the Swedes under Königsmark in July, 1648, at length overcame all the emperor's dilatoriness, and, the Osnabruck representatives having arrived at Münster a few days before, the treaty was finally signed at Münster, Oct. 24, 1648. Its terms, as regards the Germanic empire, were as follows: The sovereignty and independence of the different states of the empire were fully recognized, and liberty was given them to contract any alliances with each other, or with foreign powers, if these were not against the emperor or the empire; all religious persecution in Germany was forbidden; the treaty of Passau and the religious peace of 1555 were confirmed; and with respect to the secularization of ecclesiastical benefices, everything was to remain in Austria as it was in 1624 (hence called the *normal year*), and in the Palatinate, Baden and Württemberg as it was in 1618; the power of putting under the ban of the empire was only to be exercised with consent of the diet; and the Reformed were put on a footing of equality as to privileges with the Lutherans. The territorial changes were as follows: The Lower Palatinate was restored to the eldest son of the unfortunate "Winter king" (Frederick V., elector palatine), and an eighth electorate was created in his favor, but the Upper Palatinate and Cham were given to Bavaria, on condition that,

should the two states become united, one electorate was to be abolished (as happened in 1777, see BAVARIA); part of Alsace was ceded to France; Upper Pomerania, Rugen with Stettin, Gartz, Damme, Golnau, the isle of Wollin, Peine, Schweine, and Divenau in Lower Pomerania, Wismar, the secularized archbishopric of Bremen as a duchy, and the bishopric of Verduun as a principality, were obtained by Sweden as fiefs of the empire, with three deliberative voices in the diet, and an indemnification of 5,000,000 crowns to be paid by the empire; Brandenburg obtained, as compensation for its cessions in Pomerania, the secularized archbishopric of Magdeburg as a duchy, and the bishoprics of Halberstadt, Minden, and Camin; Hanover and Mecklenburg were compensated for their share in these cessions by secularized church lands; and Hesse-Cassel obtained the rich abbacy of Hirschfeld, with 600,000 thalers. The independence of the United Provinces was recognized by Spain, and that of Switzerland by the empire. The pope's agent, Fabio Chigi (afterward pope Alexander VII.), protested vigorously against the liberal alienation of the possessions of the church, and withdrew; and the king of Denmark's mediation being stopped by his war with Sweden in 1644, the treaty was concluded under the sole mediation of the republic of Venice, and France and Sweden became guaranties for its execution. France, Sweden, and the Protestants were the only gainers by this treaty, which, by weakening the great central authority of the empire, destroyed its unity, allowed France, as one of the guaranties, a pretext for continual interference with its internal affairs, and gave the *coup de grace* to the independence of the remaining free cities of the empire.

WEST POINT, site of the U. S. military academy, and of a fortress erected during the war of independence, on the right bank of the Hudson river, 52 m. n. of New York. The military academy is on a plain, 160 to 180 ft. above the river, surrounded by the bold scenery of one of the finest river-passes in the world. The forts and a river chain were taken by the British in 1777, but abandoned after Burgoyne's surrender, and stronger forts were built, which gen. Arnold bargained to betray—a plot foiled by the arrest of maj. André. The academy was established in 1802, for 50 cadets. Since the present system of appointment was adopted in 1843, the number has increased to above 300. It is governed by a board of five visitors and a staff of 51 professors and teachers. The education is free—each pupil engaging to serve eight years. Each member of congress has the right to nominate one cadet from his district, and ten are appointed by the president. The course of study and discipline is four years: (1) mathematics, engineering, fencing, bayonet-exercise, school of the soldier; (2) mathematics, French, fencing, tactics of infantry, artillery, and cavalry; (3) natural philosophy, chemistry, drawing, riding, tactics; (4) military and civil engineering, mineralogy, geology, chemistry, law, literature, practical military engineering, tactics.

WEST POINT (*ante*), in the t. of Cornwall, Orange co., is situated in the s. angle of a bend in the river. The military academy stands on a plateau 160 ft. above the river, with rocky heights on each side. The highest of these, where are the ruins of fort Putnam, built during the revolution, is nearly 600 ft. above the river. The main academy buildings are on the s. part of the plateau, the houses of the instructors and officers on the west. A small ledge along the steps going down to the river is called Kosciusko's garden, reached by a pair of stairs, at whose top stands his cenotaph, built by the cadets of 1828. The view from fort Putnam is considered the finest at West Point. The pass in the river is among the most beautiful in the world, while highlands 500 to 1500 ft. high rise to the n.w. and s.w. West Point has a strong natural position; protected by hills on the w. and s.w., and on the river side by an almost perpendicular wall. See UNITED STATES MILITARY ACADEMY.

WESTPORT, a small sea-port t. of Connaught, Ireland, county Mayo, stands in a pretty valley at the mouth of a small stream that falls into Clew bay, about 35 m. n.n.w. of Galway. Formerly Westport was supported principally by linen manufactures; but it is now known mostly for its trade in corn and provisions, and for its facilities for sea-bathing. In the immediate vicinity is the Reek, a mountain 2,510 ft. high, from which magnificent views of the coast and neighborhood may be obtained. In 1875, 99 vessels of 14,187 tons entered, and 70 of 10,144 tons cleared the port. The pop. was, '71, 4,417.

WEST PRUSSIA. See PRUSSIA, PROVINCE OF.

WEST TROY, a village in Watervliet, Albany co., N. Y., on the w. side of the Hudson river opposite Troy; and on the Rensselaer and Saratoga railroads, pop. of Watervliet, '80, 22,220. It is connected with Albany by the railroad, by horse-cars, and steamer. Ferry-boats run to Troy, with which it is communicated also by 2 bridges. The Hudson is here connected with the Champlain and Erie canals. The Watervliet national arsenal occupies over 100 acres in the center of the village. West Troy, which carries on a large lumber trade, includes among its manufactories, planing mills, furnaces, car-works, and a celebrated bell-foundry.

WEST VIRGINIA, a new state separated from Virginia, and included in its boundaries and statistics, was admitted into the union by act of congress, approved Dec. 31, 1862, but of disputed constitutionality, and taking effect June 20, 1863. The new state, separated from Virginia during the war of secession, comprises 54 counties lying west of

the Alleghanies, having an area estimated at 23,000 sq.m., and a pop. according to the census of 1870 of 442,014. Capital (since 1875) and largest town, Wheeling. Abundance of water-power, minerals, and timber give West Virginia great advantage for manufacturing. West Virginia has no state debt; in 1878 the value of real property in the state was \$107,352,719.

WEST VIRGINIA (*ante*), lies between lat. 37° 10' and 40° 38' n., and long. 77° 40' and 82° 40' w.; and is bounded n. by Pennsylvania and Maryland, e., s.e. and s. by Virginia, and w. by Kentucky, from which it is divided by the Big Sandy river, and Ohio, from which it is separated by the Ohio river. Its greatest length n. and s. is about 240 m., and its greatest breadth 160 miles. The area is 23,000 sq.m., or 14,720,000 acres. Much of the state is mountainous and hilly, being traversed by several parallel ridges of the Appalachian mountains, such as the Cheat, Laurel, Greenbrier, Canaan, Cowpasture, Flat Top, Rich, Briery, Gauley, Birch, Sewell, and Meadow mountains, which are generally fertile to the top and well wooded. The country slopes w. to the valley of the Ohio, and excepting the Potomac, which forms a part of the boundary between the state and Maryland, and its affluents, the rivers of West Virginia are tributary to the Ohio. The most important of these flowing directly into that river are the Big Sandy, Guyandotte, Great Kanawha, Little Kanawha, and Monongahela, all of which are navigable. The geology and mineralogy of the state comprises *erzoic* rocks in Jefferson county, on the eastern edge; lower *silurian* limestone and *Medina* sandstone; soft shales and clay slates; and coal measures that cover more than 16,000 sq.m., which contain every quality of cannel, splint, coking, block, and bituminous coal yet discovered, and all of them in thick and easily worked veins. Salt also, a usual deposit in the coal measures, is found in springs of great strength and purity of brine, and at numerous points on several of the rivers already mentioned are several large salt works. Common tufa, hydraulic, and building limestones, fire-clay, potter's clay, glass sand, ocher, barytes, black oxide of manganese, and saltpeter are found in abundance, and zinc, copper, and lead in moderate quantities. The soils of the state may be classed as clay soils, which contain 75 per cent and over of clay; sandy soils, containing 75 per cent of sand; and loams, composed of clay and sand mixed in about equal proportion. The last, however, is said to be the characteristic soil, and the greater part of the coal-measures are covered by it. The principal forest trees are the white, black or water, blue, green, and mountain ash; the aspen, beech, water-beech, black and red birch, fetid and sweet buckeye; cedar, wild-cherry, chestnut, Kentucky coffee tree, cottonwood, dogwood, and witch elm; black and southern balsam, fir, and the hemlock, spruce, the black or sour gum, and the sweet gum; three species of hickory; the white, red, and bitter nut; the holly, locust, linden, red maple, red mulberry, twelve species of oak, the poplar, sycamore, black walnut, and butternut. Altogether over 9,000,000 acres are covered with forests. The wild animals found in the state include the panther, wild-cat, lynx, wolf, black bear, raccoon, opossum, elk, deer, rabbit, and hare. The climate is generally free from extremes of heat or cold. In the highland sections the air is pure and healthful and favorable to persons having pulmonary diseases. The mean annual temperature has been found to be 52° 46', and the rainfall about 43 inches.

West Virginia came into existence as a state shortly after the breaking out of the rebellion in 1861. Up to that period it had formed the w. and n.w. portion of the commonwealth of Virginia. When the commonwealth seceded, however, the people of the western section protested, and in August met in convention to denounce the ordinance and order an election the following October to decide upon the question of organizing a new state embracing 39 counties, to be called the state of Kanawha. The votes of these counties were nearly unanimous, and a constitution was prepared and ratified by the people in May, 1862. Shortly afterward the consent of the Virginia legislature was given for the formation of the new state, the name of which in the mean time had been changed to that it now bears, and on Dec. 31 congress admitted the state to the union, upon the ratification by the people of the proposed amendment to the constitution abrogating its provision that no slave or free colored person should come into the state for permanent residence. During the month of May following state officers were elected and the state government was formally inaugurated at Wheeling, the chosen capital, with A. J. Boreman as governor. The military operations that had taken place within the territory of the new state had occurred in 1861, when the confederate forces were driven out. Immediately after the state was admitted to the union it provided the union army with 26,540 men. The state then comprised 48 counties; but four more were added after the war, since which time its progress in education, commercial enterprise, and railroad development has been rapid and notable.

Of the total population in 1870, 421,923 persons were of native and 17,091 of foreign birth; 222,842 were males and 219,171 females. The density of population was 19.22 persons to a square mile; the number of families 78,474, with an average of 5.63 persons in each; number of dwelling, 78,854, with an average of 5.61 to each. Those engaged in agriculture numbered 73,960, including 39,087 laborers and 43,702 farmers and planters; in professional and personal services, 16,699, of whom 466 were clergymen, 6,676 domestic servants, 5,815 laborers not specified, 400 lawyers, 612 physicians and surgeons, and 866 teachers; in trade and transportation, 6,897; and in manufactures

and mechanical and mining industries, 17,673. By the census of 1880 the total population of the state was 618,193. Those of native birth numbered 599,970, of foreign, 18,223; the white population was 592,433, and the colored, 25,760. The gain in population during ten years amounted to 156,179 persons. The capital and largest city, Wheeling, in 1870 had 19,280 inhabitants, and by the last census, 31,266. None of the other most important cities and towns, Charleston, Clarksburg, Grafton, Martinsburg, Parkersburg, Piedmont, and South Wheeling, had in 1870 over 4,000 inhabitants; but it is probable that they will be found, on the publication of their statistics in 1880, to have increased largely since then. There were in 1870, 8,528,394 acres of land in farms in the state, of which 2,580,254 acres only were improved lands. The cash value of the farms was \$101,604,381; of farming implements and machinery, \$2,112,937; the total estimated value of all farm productions, including betterments and additions to stock, \$23,379,692. The principal farm products were 2,483,543 bushels of wheat, 277,746 of rye, 8,197,865 of Indian corn, 2,413,749 of oats, 82,916 of buckwheat, 2 bales of cotton, 37 tons of hemp, 82,276 lbs. of flax, 1031 lbs. of hops, 1,593,541 of wool, 224,164 tons of hay, 2,046,453 lbs. of tobacco, 1,053,507 bushels of Irish potatoes, 46,984 bushels of sweet-potatoes, 490,606 lbs. of maple-sugar, 20,209 galls. of maple-syrup, 780,829 of sorghum syrup, 376,997 lbs. of honey, 9,917 of bees-wax, and 6,093 galls. of domestic wine. The value of live stock in 1879 was stated to be \$17,175,450; the number of horses, 99,362; of mules and asses, 2,139; of neat cattle, 337,881; of sheep, 552,327; and of swine, 268,031. The manufactures are principally of leather, lumber, and tobacco-products, and salt, lime, refined oil, carriages, and woolen goods. In 1870 there were 2,444 manufacturing establishments, having \$11,084,520 capital, employing 11,622 hands, and producing yearly goods valued at \$24,102,201. There were also 184 mining establishments, employing 1,504 hands, and having a capital of \$2,040,213. The total value of products was \$2,088,531, including bituminous coal valued at \$1,035,862, petroleum, \$1,029,119, and stone, \$23,550. The railroad facilities for trade and transportation in 1876 consisted of seven roads which had within the state about 600 miles of road. These were the Baltimore and Ohio, Chesapeake and Ohio, Laurel Fork and Sand Hill, Pennsylvania and Harrisville, Pittsburg, Cincinnati and St. Louis, Wheeling, Pittsburg and Baltimore, and Winchester and Potomac. Whatever foreign commerce the state has is carried on by way of New Orleans, where the imports are appraised. Altogether the business and wealth of the state in 1875 supported 15 national banks with a paid-in capital of \$1,848,000, and an outstanding circulation of \$2,065,769; 10 state banks, reporting an aggregate capital of \$975,000; and 2 savings banks with a capital of \$100,000. There were also 14 fire and marine insurance companies in the state, having a capital of \$1,438,450, and reporting assets amounting to \$2,321,858.

Financially the state is in a prosperous condition. Aside from a portion of the debt of Virginia, existing at the time of the separation, which portion, it is claimed, should not be more than \$1,500,000, there is no public debt. The assessed value of real estate in 1875 was \$110,922,030, and the state tax amounted to \$573,307. The revenue from all sources during the fiscal year ending in Sept., 1878, was \$693,406; the disbursements on all accounts, \$572,343; and the cash balance in the treasury was \$313,801.

The free-school system, though of recent origin, is in efficient operation. The supervision and management of the schools are vested in a state superintendent elected every four years, county superintendents elected every two years, and district boards and trustees. The constitution prohibits the teaching of white and colored children in the same school, and provision is made for separate schools for the colored. In 1875 the permanent school fund amounted to \$325,243; the current teachers' fund, \$541,358; the current building fund, \$255,233; and the aggregate amount expended for school purposes during the preceding year was \$796,592. The school population enrolled at that time was 179,897 youths between the ages of 6 and 21; and the average attendance was about 49 per cent. The whole number of schools was 3,231; of school-houses, 2,959; of teachers, 3,461; and the value of school property was estimated to be \$1,605,627. A state normal school was established at Huntington in 1867, and branches have since been located at West Liberty, Glenville, Shepherdstown, and Concord. The colleges, universities, and professional schools are Bethany college (Disciples), at Bethany; West Virginia college (Free-will Baptist), at Flemington; West Virginia university (state), at Morgantown; and St. Vincent college (Roman Catholic), at Wheeling. The total number of libraries in the state in 1870 was 1728, having 372,745 vols., of which 1090 with 220,562 vols., were private. The number of newspapers and periodicals published is about 75, of which 6 are daily, 61 weekly, and 4 monthly. The religious organizations numbered 1529 in 1870, and possessed 1018 edifices and property valued at \$1,835,720. The denominations were: Baptist, 325; Disciples, 4; Protestant Episcopal, 21; Evangelical Association, 2; Jewish, 1; Lutheran, 23; Methodist, 879; Presbyterian, 89; Reformed Church in the United States, 2; Roman Catholic, 40; Second Advent, 3; United Brethren in Christ, 94; Universalist, 4.

The constitution of the state gives the right of suffrage to all male citizens 21 years old, with the usual exceptions, who have resided in the state one year, and the county 60 days, preceding the election; and only qualified voters are entitled to hold any state, county, or municipal office. The governor, secretary of state, state superintendent of free schools, auditor, treasurer, and attorney-general are elected by the people for the

term of four years. The legislature consists of a senate of 24 members, and a house of delegates of 65 members. The judicial power is vested in a supreme court of appeals, consisting of 4 judges, 9 circuit courts, and 54 county courts. The state's representation in congress, by the apportionment of 1872, is the usual 2 senators and 3 members of the house. The number of electoral votes are 5. These have been cast as follows: 1864, Lincoln and Johnson, 5; 1868, Grant and Colfax, 5; 1872, Grant and Wilson, 5; 1876, Tilden and Hendricks, 5; 1880, Hancock and English, 5.

WETMORE, PROSPER MONTGOMERY, 1798-1876; b. Conn., went into business in New York. He began to write for the periodicals when 18 years of age and soon became a figure in the literary and artistic society of New York. His *Lexington, with other Fugitive Poems*, appeared in 1830. Eight years later he published, with a memoir, an edition of the poems of James Mack, and in 1847 *Observations on the Origin and Conduct of the War with Mexico*. He served in the legislature, where he was chairman of the committee on colleges and academics. He was a regent of the university of the city of New York.

WETSTEIN, the name of a Swiss family illustrious for the talents and learning of its members, originally from Kyburg, in the canton of Zürich. Among the more noteworthy are—(1.) JOH. JAKOB WETSTEIN, born at Basel in 1594, who was first in the service of the Venetian state. In 1620 he became a member of the supreme council of his native town; represented Switzerland at the peace of Westphalia (1648); was raised to the rank of a noble in 1653, and died in 1666.—(2.) JOH. RUD. WETSTEIN, son of the preceding, was born at Basel in 1614, and died there in 1683, professor of theology. He was a great opponent of the introduction of the *Formula Consensus*, and assisted Suicer in drawing up his *Thesaurus Ecclesiasticus*.—(3.) JOH. RUD. WETSTEIN, son of the preceding, born at Basel in 1647, and died there in 1711; also professor of theology, favorably known as an early editor of Origen.—But the most distinguished member of the family is JOH. JAK. WETSTEIN, son of Joh. Rud. Wetstein, the younger, who was born at Basel, Mar. 5, 1693. After a thorough study of the classics, Hebrew, philosophy, and mathematics, he was made a PH. D. at the age of 16. Four years later, he became a minister, and gave himself up to the study of the New Testament. In 1717 he began to give lessons in theology at the university of Basel, and continued to do so until 1730, when (being suspected of Socinianism) he was forced to leave Switzerland. He sought an asylum in Holland, where the Remonstrants appointed him professor of theology at Amsterdam in 1733. He died there Mar. 23, 1754. Wetstein's great work is his edition of the New Testament, with prolegomena, a collection of various readings, and Latin notes (2 vols., Amst. 1751-52). Its publication marks an epoch in the history of New Testament criticism. Semler reprinted the prolegomena with additions (Halle, 1764).

WETTE, DE. See DE WETTE.

WETTER, LAKE, after lake Wener (q.v.), the largest lake in Sweden, lies in Gothland, about 25 m. s.e. of lake Wener in direct line. It is 70 m. long, 13 m. in average breadth, has an area of 850 sq.m., is 370 ft. in greatest depth, and is 300 ft. above the level of the Baltic. It receives about ninety small tributaries, though its waters have only one outlet, the Motla river, which, flowing eastward, maintains the communication of the lake with the Baltic. Its waters are clear, and of a beautiful green color, and it is surrounded by lofty romantic shores, almost unbroken by bays. It is remarkable for an irregular alternation of risings and fallings, and for an occasional undulation, which is so rapid and violent as to break the thick sheet of ice with which it is covered in winter. An intricate chain of small lakes, continued westward by the Göta canal, connects lake Wetter with lake Wener, and thus with the Cattegat. Lake Wetter contains few islands, and of these the chief is Wisingsö, 7 m. long by 1½ m. broad.

WETTERHORN (Peak of Tempests), a lofty mountain of the Bernese Oberland, Switzerland, on the e. side of the Grindelwald, and about 10 m. s.e. of the lake of Brienz. From the path by which it is ascended, it rises in one vast precipice of alpine limestone, seeming to threaten the traveler. The three peaks of the Wetterhorn are respectively 12,149, 12,166, and 12,107 ft. high.

WETZEL, a co. in n. West Virginia, having the Ohio river for its n.w. boundary; 360 sq.m.; pop. 80, 13,896-13,489 of American birth, 21 colored. Co. seat, New Martinsville.

WETZLAR, a small t. of Rhenish Prussia, charmingly situated on the Lahn, 40 m. n. of Frankfurt-on-the-Main. Part of its old cathedral is said to date from the 11th century. Wetzlar is notable as the scene of the *Sorrows of Werther*. Pop. '75, 6,856.

WEXFORD, a co. in n.w. Michigan, drained by the Manistee river and its branches; containing lake Otisgo and other small lakes; 625 sq.m.; pop. '80, 6,815-5,132 of American birth, 17 colored. Co. seat, Sherman.

WEXFORD, a maritime co. of the province of Leinster, Ireland, is bounded on the n. by the county of Wicklow, on the e. by the English channel, on the s. by the Atlantic, and on the w. by the counties of Waterford, Kilkenny, and Carlow. Its greatest length n. and s. is 55 m., and its greatest breadth e. and w. is 34 miles. The total area comprises 900 sq. m., or 576,616 acres, of which 510,702 are arable, 45,501 uncultivated, 14,325 in plantations, 2,392 in towns, and 3,668 under water. Pop. '71, 132,666, of whom 120,356 were Catholics, 11,296 Episcopalians, and the rest Protestants of other denominations. The coast-line of Wexford, which extends from Kilmichael point to the estuary of the Suir, Waterford harbor, is irregular, and very dangerous for shipping. From the above-named point to Wexford harbor there is no opening for navigation; and as Wexford harbor, besides being intricate and dangerous, is also obstructed by a bar, it offers little security in boisterous weather; but considerable improvements have lately been made. The coast from the southern headland of Wexford harbor, Rosslare point, to the mouth of the Suir, presents a succession of bays and headlands. The headland called Carnsore point is the s.e. extremity of Ireland. Parallel with the northern coast-line, at a distance of a few miles, is a range of sand banks; and the southern shores are beset by outlying rocks and islets, which, although somewhat guarded by light-houses and light-ships, frequently prove fatal to shipping. The greater part of the surface is tolerably level, but some detached hills rise to considerable elevation. The mountains of the border are much more elevated, the highest point of the Blackstairs being 2,409 ft.; and of mount Leinster, 2,610. There are few lakes, and these of small size. The principal river is the Slaney, which for some distance is the boundary between Wexford and Carlow, but enters Wexford near Newtownbarry, whence it flows by Enniscorthy into the sea in Wexford harbor. In its geological structure, Wexford belongs to the eastern clay-slate tract, which stretches in a south-westerly direction from the n. of Wicklow to the Atlantic, and which extends across the level districts as far as the granite range separating Wexford from Carlow. Granite is found in the s.e. of the county, and, in some of the detached hills, as are also beds of greenstone. Silver was formerly raised near a place called Clonmines, where traces of an ancient mine are still seen, and galena has been found in the same place. Copper ore is found at a place called Keriegue, near Wexford, and plumbago and asbestos near Enniscorthy. The climate is said to be singularly temperate, and the district is more suitable for agriculture than the counties of Carlow and Kilkenny, although inferior in fertility. The total acreage under crops in 1878 was 216,590, or about two-fifths of the county, oats and barley being the principal crops. The breeds of live-stock have been recently so much improved that Wexford has carried off first prizes at various cattle shows. The annual value of property in Wexford, under the valuation act, is £375,259. There are but few and inconsiderable manufactures, and the trade is chiefly in the export of agricultural produce, especially barley; butter, cattle, pigs, poultry, and eggs are also exported in large quantities. The pupils at the national schools in 1877 numbered 17,893. Wexford is divided into ten baronies. Of these the barony of Forth is very remarkable as having preserved, from the 12th c. down to the very last generation, a dialect of English quite peculiar, as well as many peculiar usages and social habits. The principal towns are Wexford (q.v.), Enniscorthy, New Ross, and Gorey; Newtownbarry and Taghmon have each a population of about 1000; and Duncannon is noticeable for its ancient fort and interesting historical associations. The maritime position of Wexford laid it open early to the incursions of the Danes, to whom the name Wexford, or Weisford, is traced by antiquaries. It was the first landing-place of the English in the invasion, and formed part of the tract granted to them by MacMurrough. By the marriage of Strongbow with Eva, MacMurrough's daughter, it came into his hands; and after the partition of his lands among his daughters at his death, Wexford underwent many changes of masters. During the civil wars which followed 1641, Wexford was the scene of frequent contests; and in the more recent insurrection of 1798, it formed the theater of the only formidable conflicts of the peasantry with the regular troops. There are numerous relics of antiquity, Celtic as well as Anglo-Norman, in almost every part of the county. Upward of a hundred castles are still traceable, and many ecclesiastical remains, of which the monasteries of Dunbrody, Tintern, Ross, and some others are not unworthy of the best days of mediæval architecture. Wexford returns four members to parliament; two for the county, one for the borough of Wexford, and one for that of New Ross.

WEXFORD, capital of the county of that name, a seaport, and parliamentary and municipal burgh, is situated at the mouth of the river Slaney, 74 m. s. from Dublin, with which it communicates by the Wicklow, Wexford, and Waterford railway, now completed. The pop. in '71 was 12,077, of whom 11,196 were Roman Catholics, 717 Protestant Episcopalians, and the rest Protestants of other denominations. The town is situated on the south-western shore of the estuary of the Slaney, which is known as Wexford harbor, and along which the quay extends nearly 1000 yards, forming a spacious and not inelegant terrace. Behind this, the town extends in two nearly parallel streets. There are two Protestant and three Catholic churches. Of the latter, two are modern and handsome structures. One of the former, St. Selsker's, is ancient,

part of its walls dating from the English invasion. There are also a Presbyterian, a Methodist, and a Quaker meeting-house; a convent of Franciscan friars, five nunneries, a Roman Catholic college, and National, Christian Brothers', and conventual schools. Besides the union work-house, there are also an infirmary and a fever hospital. The only manufactures of any importance pursued are those of distillation and the grinding of corn; the chief industry of the town being in connection with the export trade of the county, already described. The position of Wexford for export trade, favorable in itself, is much marred by the shallowness and intricate character of the channel of the Slaney, which has the further disadvantage of being obstructed by a bar. Great improvements have been made, a patent slip and dock have been constructed, steamers are employed in the export of cattle and provisions, and an active shipping trade is carried on. The Wexford fisheries also have long been reckoned among the most valuable on the eastern coast. The town is extremely ancient, and was occupied by the Danes as one of their strongest settlements. From the time of the invasion, it became an English stronghold against the native population. During the civil wars of 1641, it was occupied by the confederated Catholics, but was taken by Cromwell in 1644. The insurgents of 1798 also had possession of it for a short time. Wexford returns one member to the imperial parliament. In, '77, 817 vessels, of 76,082 tons, entered, and 842, of 76,958 tons, cleared the port.

WEYER'S CAVE, in Augusta co., Va.; is on an offshoot from a branch of the Blue Ridge mountains. It is so called from Bernard Weyer, by whom it was discovered in 1804. It is a stalactite cavern, next in importance to Mammoth and Wyandotte caves. Its largest apartment, Washington's hall, is 250 ft. long, and more than 90 ft. high.

WEYMOUTH, a township of Massachusetts, on Boston harbor, twelve m. s.e. of Boston, on South Shore railway, containing the four post-villages of Weymouth, East Weymouth, North Weymouth, and South Weymouth, with large factories of nails, boots and shoes, etc. Pop. in '75, 9,819.

WEYMOUTH-AND-MELCOMBE-REGIS, a sea-port, a fashionable watering-place, and a municipal and parliamentary borough of Dorsetshire, on a bend of the coast facing the s.e., and at the mouth of the river Wey, three m. n. of the isle of Portland, and eight m. s. of Dorchester by railway, seven in a straight line. A projecting point, called the Nothe, separates the two quarters—the old town of Weymouth lying to the s. of it, the modern town, Melcombe-Regis, extending to the n. and facing the sea. The two quarters communicate by means of a bridge with a swing in the middle, to permit the passage of ships. The old town is uninteresting in appearance; Melcombe-Regis, elegantly built, stands on a narrow peninsula, with the sea on the e., and an estuary on the w. side. Its chief features are the sea-terrace and esplanade, the latter adorned with a statue of George III., who largely patronized Melcombe. The harbor has 14 ft. of water at full tide, and in the bay there is good anchorage in seven or eight fathoms. Portland harbor, just recently completed, will be a source of great trade to the town. Weymouth-and-Melcombe-Regis, is the seat of steam-traffic to the channel islands. Ship-building, rope and sail making, and the export of Portland stone and Roman cement, employ the great mass of the inhabitants. The town is connected with the Great Western and London and South-western railways, and one connecting it with Portland isle was opened in 1865. Pop. '71, 13,259.

WHALE, the popular name of the larger cetaceans, particularly of all those belonging to the families *balenidae* and *physeteridae* or *catodontidae*. The latter family has already been noticed in the article *CACNOLOR*, and some of the species of *delphinidae*, also sometimes called whales, have been described in separate articles, as the *CALING WHALE* and the *BELUGA*. The *balenidae* alone remain to be described now. In this family, the head is of enormous size, as in the *catodontidae*, but is entirely destitute of teeth, instead of which, the palate is furnished with an apparatus of *baleen*, or *whalebone*, for the purpose of straining out of the water the small crustaceans and acalaphae, which form the food of these whales. Rudiments of teeth, however—dental pulps—appear in the fetus of the whale—sixty or seventy on each side of each jaw but they are re-absorbed into the system, and the plates of whalebone are not produced from them but from the integuments.

The fibrous structure of baleen, or *whalebone*, its elasticity, and its heaviness are well-known. The plates of it in the mouth of a whale are very numerous, several hundreds on each side of the mouth, and they are very closely placed together, so that the mouth is filled with them; the whole quantity in the mouth of a large whale sometimes amounting to nearly two tons in weight. They are suspended from the roof of the mouth; none proceed from the lower jaw. They extend on each side from the middle line of the palate, like the barbs of a feather; those in the middle of the mouth are longest. The base of each plate is embedded in the substance of the membrane that covers the palate, while its edge forms a loose fringe, composed of fibers or pliant bristles. The vast mouth being opened, water is taken in; and the small animals which enter with it being retained for food, the water is allowed to escape by the sides of the mouth.

The tongue is a soft thick mass, not extending beyond the back of the mouth. The gullet of whales is very narrow; it is said not to be more than an inch and a half in diameter even in a large whale, so that only very small animals can pass through it. The

head of whales occupies from a third to a fourth of the whole length. The skull is unsymmetrical, the right side being larger than the left. The flesh is red, firm, and coarse. The skin is naked, with the exception of a few bristles about the jaws, and its surface is moistened by an oily fluid. The lower surface of the true skin extends into a thick layer of *blubber*, an open network of fibers in which fat is held. The blubber is from a foot to two feet in thickness, the whole mass in a large whale sometimes weighing more than thirty tons, and serves the purpose of keeping the animal warm, as well as of making the specific gravity of the whole body much lighter than it would otherwise be, and of resisting the pressure of the water in the great depths to which it often descends.

The skin of whales is always infested with parasites; mollusks adhere to it; certain kinds of cirrhopods burrow and live in it; and crustaceans, such as the whale-louse (q.v.) attach themselves to it, and feed upon it.

It has been attempted to calculate the age of whales from the transverse lines on the plates of baleen, and in this way it has been computed that they attain the age of 800 or 900 years, each transverse line being assumed to indicate an annual check of growth, but it is evident that there is no good ground for the assumption on which such calculation proceeds.

In the genus *balæna* there is no dorsal fin, nor elevation of the back corresponding to it, as in some of the family. The belly is smooth, not plaited, as in the other genera of the family. The most important species, and indeed the most important of all the whales, is that known as the RIGHT WHALE, or GREENLAND WHALE (*B. mysticetus*). It inhabits the seas of the northern parts of the world, and abounds chiefly in the arctic regions. It is sometimes seen on the coasts of Britain, and even in more southern latitudes. It attains a size of sixty or seventy feet in length. The body is thickest a little behind the *flippers*, or pectoral fins, tapering conically toward the tail, and slightly toward the head. The tail is five or six feet long, and from twenty to twenty-five feet broad; formed of two diverging lobes, broadest almost where they are united, but with a slight indentation. The pectoral fins are eight or nine feet long, and four or five feet broad. The mouth is fifteen or sixteen feet long. The eyes, which are situated on the sides of the head, about a foot above and rather behind the angles of the mouth, are not larger than those of an ox; but the sense of sight seems to be acute, at least in the water. The iris is white. The blow-holes are situated on the most elevated part of the head; they are from eight to twelve inches long, but of comparatively small breadth. The upper parts are velvety black, the lower parts white. The upper parts, in very old whales, sometimes become piebald, the black being mixed with white and gray. The period of gestation is uncertain; one young one is produced at a birth, and is from ten to fourteen feet in length when born. The mother displays great affection for her offspring, of which whale-fishers sometimes take undue advantage, harpooning the young one—itsself of little value—in order to secure the mother. Suckling is performed at the surface of the water, and the mother rolls from side to side, that she and the young one may be able to breathe in turn. The usual rate of progress in swimming is about four or five miles an hour, and whales often swim not far beneath the surface of the water, with the mouth wide open to take in water from which to sift food. The whale is capable, however, of swimming with much greater rapidity, and when harpooned, it often descends to a great depth in a few seconds. Its tail is extremely powerful, and a single blow of it is sufficient to destroy a large boat, or toss it and its crew into the air, so that the whale-fishery is attended with no little danger. Whales usually come to the surface to breathe at intervals of eight or ten minutes, but they are capable of remaining under water for half an hour or more. When they come up to breathe, they generally remain on the surface about two minutes, during which they blow eight or nine times, and then descend. The noise which they make in blowing is very loud, and the spout of spray ejected ascends several yards into the air, appearing at a distance like a puff of smoke. They often assume, as if in sport, a vertical position, with the head down, and flap the surface of the water with the tail, making a sound which is heard two or three miles off. The Greenland whale is not properly gregarious, being generally found alone or in pairs, except when numbers are attracted to particular feeding-grounds, as is sometimes the case in the bays and inlets of northern coasts.

It was formerly supposed that the Greenland whale was an inhabitant of the southern as well as of the northern parts of the world; but the SOUTHERN or CAPE WHALE (*B. australis*) is now regarded as a distinct species, the head being smaller in proportion than that of its northern congener, and the color a uniform black. It attains the length of 50 or 60 feet. It is usually found in comparatively shallow water near coasts. It occurs not only in the colder parts of the southern hemisphere, but throughout its temperate regions, and its range extends into the tropics. It has been taken even as far n. as Japan. Its capture is prosecuted to a considerable extent, particularly on the coasts of south Africa and New Zealand, although this whale-fishery is not nearly so important as that of the northern seas. Several other species of *balæna* have been described, but they are imperfectly ascertained and characterized, specimens not often coming under the observation of competent naturalists in a perfect state. The *nord-kaper* of the Icelanders has by some naturalists been described as a distinct species, although it is more generally regarded as a variety of *B. mysticetus*. It differs, however, from the common variety in having the body more slender and the head propor-

tionally smaller; the upper jaw very round, deep and broad; and the plates of baleen comparatively short. It is of a gray color; the lower part of the head of a brilliant white. It is said to be more active and more fierce than the common whale, so that its capture is attended with greater danger.

The species of the genus *megaptera* are called HUMP-BACKED WHALES, and by whale-fishers ordinarily *hump-backs*. They have a rudimentary dorsal fin, in the form of an elevation of the back. There are several species, but some of them are very imperfectly known. *M. longimana*, so called from the length of the pectoral fins, is found in the North sea, and is included in the British fauna. *M. americana*, the BERMUDA HUMP-BACKED WHALE, occurs chiefly about the Bermudas, from which its baleen is extensively imported. Another species, *M. paskop*, occurs at the cape of Good Hope.

The genus *balænoptera*, *physalus*, or *rorqualus* is distinguished by having a dorsal fin. See RORQUAL.

All the species of these genera are objects of pursuit to whale-fishers, although the Greenland whale is that which they prefer.

Important as the whale is to civilized man, both for the oil and the whalebone which it yields, it is still more important to the rude natives of arctic regions, as the Esquimaux and Greenlanders, who use its oil for food as well as for burning, and to whom its flesh also is a chief article of food; while its bones and baleen are used for making tents, sledges, boats, harpoons, and spears; the sinews supply a substitute for twine or thread; and the membranes are used instead of glass for windows. There is no essential difference in the way in which the capture of whales is prosecuted by the rudest tribes and the most civilized nations. The whale-fishers approach the whale in boats, and attack it by harpoons to which lines are affixed, following up and repeating the attack, until its strength is exhausted, taking advantage of the necessity which it experiences of coming at intervals to the surface to breathe, and finally killing it with lances, which are thrust into the most vital parts.

In its most simple form, the harpoon is an iron spear about 5 ft. in length, with a much flattened point, having sharp cutting edges, and two large flattened barbs. Many modifications have been made, the most important perhaps being the gun-harpoon. The ordinary harpoons are attached to a long line at the opposite end to the barbed point, and when the boat is near enough to the whale, the man whose duty it is darts or plunges the weapon with all his force into the animal's side. In its fleeing from the attack, the line is rapidly drawn out of the boat, until the creature is tired, and rises to the surface for air. The boat follows, keeping as much of the line as possible, until, exhausted by pain and loss of blood, the animal succumbs. It will be seen that much depends upon the sharpness of the blade-like edges of the barbs, and their power to hold when in; hence many ingenious devices of movable barbs have been contrived, which close on the shaft of the instrument in going into the animal's flesh, but open outward as soon as there is any strain on the shaft. The gun harpoon is a short bar of iron with the barbed spear at the end, and a ring with chain for the attachment of the line; this is fired from a small swivel cannon attached to the whaler's boat. However well the harpoon may be fixed in the animal's body, its death and capture are still very difficult matters to accomplish, and take much time. To obviate this, a very ingenious expedient was suggested by sir R. Christison, the eminent toxicologist of Edinburgh university, that glass tubes containing prussic acid should be so placed in the shaft of the harpoon that the moment the cord or line was pulled tight they would be broken in the animal's body, and occasion instant death. This plan has been tried with great success, but has met with opposition from the whale-fishers, who have a prejudice against using a poison which they see has such deadly effects. Another mode of employing prussic acid is to inclose a glass tube containing it, in a hollow rifle bullet about 4 in. long, which is fired from a rifle made for the purpose, the bullet containing also an explosive substance connected with a fuse, which is kindled as the rifle is fired, so that the bullet bursts immediately after penetrating the whale, and spreads its deadly contents through the flesh. The bullet is made of zinc, because it breaks into fragments more angular than any other metal. The success of this method has been found to be perfect, but sailors object to its use, dreading to touch the carcass of a whale which has been killed by so powerful a poison, for a whale struck by a bullet charged with prussic acid only disappears for about five minutes, and rises to the surface dead. Strychnia has been used instead of prussic acid, and with similar results.

The lance used for killing the whale has generally a blade 5 or 6 in. long, and 2½ or 3 in. broad, with sharp cutting edges, and a long wooden handle.

The ships fitted out for the northern whale-fishery are generally screw-steamers, of from 400 to 600 tons burden. To protect them from injury by ice, they are fortified with an additional series of planks, iron plates, and a *false* or *ice* stem, on the sides of which are *ice-knives*—angular blocks of wood filling up the concavity formed by the stem and fore-planks. The stern is also defended by *ice-plates* of half-inch iron; and many timbers and stanchions are added in the interior of the vessel, great strength being a more important requisite than fast sailing. Each ship has generally six or seven boats, *carrack-built*, from 23 to 28 ft. in length, each capable of carry 6 or 7 men, with 7 or 8 cwt. of whale-lines, etc. The crew of a whaler consists of 40 or 50 men, each of whom, from the master to the boys, generally receives, in addition to his fixed wages, a gratuity

for every whale caught, and a certain sum for every ton of oil produced by the cargo. Each boat carries 2 harpoons and 6 or 8 lances. When the ship arrives in the vicinity of a whaling-ground, a look-out is stationed at the mast-head. As soon as a whale is discovered, the boats are lowered, and a competition ensues among their crews, all exerting their utmost strength to reach the whale first. The harpooner is ready, as soon as the boat is sufficiently near the whale, to hurl his harpoon with all his force; the crew instantly back the boat, and the whale generally plunges in terror to a great depth, sometime carrying out more than 200 fathoms of line. It remains below for 20 minutes or more, and when it rises, the boats hasten to it again; it is stuck with a second harpoon, and probably, instead of at once descending, it strikes violently with its tail, to destroy its enemies, when great caution is requisite. It cannot now remain long below the surface, and when it comes up, probably spouts blood through the blowholes. When it is lanced, it sometimes dies almost at once, but sometimes there is a terrific struggle—the water is lashed into foam, and dyed with blood. It not unfrequently happens that instead of dying at the surface of the water, the whale descends, and does not rise again, so that it is lost to the whaler. The carcass of the whale is towed by the boats to the ship, and made fast to the ship's chains. The process of *flensing* is then commenced. Some of the crew, having their boots armed with iron spikes, to prevent them from slipping, descend upon the carcass, and cut into the blubber with *blubber-spades*, removing a broad strip or *blanket* of skin, 20 or 30 ft. long, which is hoisted to the deck by means of a hook and tackle. Great cubical pieces of blubber, of half a ton or a ton in weight, are then cut out, and hoisted on deck. In this way, the process is carried on, the whale being turned over and over, that every part may be reached; till in three or four hours, the whole mass of blubber is removed from it—probably amounting to 20 or 30 tons. Meanwhile others of the crew have descended into the mouth of the whale, and removed the baleen. The remainder of the carcass is then flung adrift, and sometimes sinks, but often swims, in consequence of incipient putrefaction, to afford food for bears and fishes. The blubber, after being received on deck, is cut into smaller cubical pieces, and subjected at leisure to a process by which the cellular tissue is separated from it. This is called *making-off* or *trying out*; and to accomplish it, the blubber is heated in a large pot, and afterward strained, the scraps or cracknels from one pot serving as fuel for another, and the ship being made filthy with smoke, soot, and grease. The prodnet is finally stored in casks, to be conveyed home, and boiled for oil. A ton of blubber yields nearly 200 gallons of oil. A single whale often yields blubber and whalebone to the value of £700 or £800. The whalebone is subjected to no process but that of drying till it is brought home.

Ships often return from the whale fishery *clean*—i.e., without having captured a single whale. The greatest number of whales known to have ever been captured by a single vessel in a season is 44; yielding 299 tuns of oil, of 252 gallons each. This was in 1814; the fortunate whaler belonged to Peterhead, in Scotland, and the oil alone, according to the price of that year, £32 per tun, was worth £9,568. When the price of oil and whalebone has been higher, even greater profits have been realized by whalers making fewer captures.

It is usual for whalers to resort to the arctic whale-fishery in spring, and to return in autumn; but capt. Penny adopted with great success, in 1853–54, the method of wintering in the arctic regions.

The Norwegians sent vessels to Greenland for the whale-fishery in the 9th century. They had previously prosecuted it on their own coasts, and the Norman settlers on the bay of Biscay carried it on there, whales inhabiting that bay in considerable numbers, till, through the eager prosecution of the fishery, they became so few that about the 15th c. it became unprofitable, and was relinquished. In 1261 a tithe was laid upon the tongues of whales brought into Bayonne, they being then highly esteemed for food. The French, Spaniards, and Flemings early began to fit out vessels for the northern whale-fishery; the English entered upon it with great spirit in the end of the 16th c., and about the same time the Dutch, Danes, and Hamburgers. The British Muscovy company obtained a royal charter, giving them a monopoly of the whale-fishery of the coasts of Spitzbergen, on the pretense of its having been discovered by sir Hugh Willoughby, although, in fact, it was discovered by the Dutch navigator Barentz. Other nations were not disposed to acknowledge the claims of the English; the Dutch in particular sent out a strong fleet, between which and the ships of the Muscovy company an engagement took place in 1618 and the English were defeated. The Spitzbergen bays and seas were afterward divided into fishing-stations, allocated to the whalers of the rival nations. No nation now asserts a claim to the exclusive right of whale-fishing in any quarter. The Spitzbergen fishery was thrown open to all nations in 1642.

The English for some time prosecuted the whale-fishery sluggishly and with incompetent means; the Dutch carried it on with great vigor and success. During the latter half of the 17th c. the Dutch furnished almost all Europe with oil. In 1680 they had 260 ships and about 14,000 men employed in the whale-fishery; but from that time the Dutch fishery began to decline. In 1732 Great Britain attempted to encourage the whale-fishery by a bounty of 30s. a ton to every ship of 200 tons engaged in it, which was raised in 1749 to 40s., reduced to 30s. in 1777, and again raised to 40s. in 1781. The object of the bounty was not only to encourage the trade, but to make it a nursery for seamen,

Ships, however, were fitted out rather for the bounty than for the capture of whales, and during the next five years after the reduction of the bounty in 1777 the number of ships employed in the trade was reduced from 105 to 39. After 1781 it rapidly increased, and continued to increase although the bounty was reduced. The bounty was finally altogether withdrawn in 1824; yet in 1815, when the British whale-fishery was in its most flourishing condition, only 164 ships were engaged in it. The Dutch whale-fishery had in the meantime almost entirely ceased, owing to the national calamities consequent on the French revolution. The British whale-fishery is still prosecuted, although not nearly to the extent that it was fifty years ago. The French whale-fishery has in like manner declined. The Americans are at present more actively engaged in the whale-fishery than any other nation. The New England colonies entered upon this enterprise at a very early period, at first merely by boats on their own coasts, which, however, were deserted by whales before the middle of the 18th c., and ships then began to be fitted out for the northern seas. For a number of years, however, the American whale-fishery also has been declining, owing to the scarcity of whales, and because substitutes for whale-oil and whalebone have been found.

Of all British towns Peterhead and Dundee are those which of late have shown the greatest enterprise in the whale-fishery, and next to them is Hull. In America, New Bedford demands special notice. It is at present the greatest whaling-port in the world.

The ships engaged in the whale-fishery generally add to their cargoes of oil by the capture of seals.

WHALES, in point of law, belong to the crown, according to the law of England, if they are caught or found within the territorial sea—that is, within the limit of three miles from the shore; or in the inner seas, as distinguished from the open sea. This is contrary to the general rule—that he who first captures a wild animal is entitled to the property thereof. Whales are thus called royal fish; and it is said sturgeons and porpoises also fall under the same class. If the whales are not caught in the territorial seas which are part of the realm, but in the open sea, then the law of nature applies, or rather a secondary law or custom governs the right of property, and that law, though varying slightly according to locality, is, that the person who first captures the whale is entitled to keep it. In the Greenland seas the local custom is that the first harpooner who strikes the whale is entitled to the property only if he continue to hold the whale by the line attached to his harpoon; but if his line break, and a subsequent harpooner from another ship finish the capture by obtaining possession, then the latter is entitled, for it is a loose fish. This rule, however, has been qualified in this way, that the first harpooner who strikes the fish and keeps it entangled is entitled, even though a volunteer come up and officiously strike the fish, thereby causing it to struggle and break from the first line. At Gallipagos, South America, the custom is that he who first strikes the whale with a dromg, or loose harpoon, is entitled to receive half of it. The same rules govern the right of property in whales when similar questions arise between parties litigating in Scotland. The law of Scotland, as well as England, adopts whatever local custom prevails where the whale was captured.

WHALEBONE. The baleen plates which take the place of teeth in the mouths of the baleen whales (see WHALE), constitute the whalebone of commerce. They vary in length from a few inches up to ten, and even in rare instances 12 feet. Their chemical constitution is albumen hardened by a small proportion of phosphate of lime. Their color is usually of a bluish black, but in some species they are striped longitudinally with bands of a whitish color; and they terminate at the point in a number of coarse black fibers of the baleen, which fibers are also found more or less down both sides of the blade. These fibers are much used by brushmakers. There are three principal kinds in the market, and they are generally known as *whale-fins*. The first is the *Greenland*, or Davis's strait and North sea fins; second, the South sea, or black fish-fins; third, the n.w. coast, or American whale fins. Whalebone requires some preparation before being fit for use; this, however, is very simple. It is first trimmed—that is, all the hairs are removed from the point and edges of each blade; and generally the surface of each flat side is scraped. The blades are then boiled in water for several hours, until they become soft enough to be cut easily with a common knife. The workman then cuts them into lengths fitted for the purposes to which they are to be applied. They are chiefly used in thin strips, such as stay-bones and umbrella-ribs, and can be easily split for such purposes, owing to their lamellar structure. Generally the boiling is combined with a dyeing process, to make the whalebone perfectly black, which is preferred to the not agreeable natural color. The quantity annually imported into Britain fluctuates greatly: between 1873 and 1877 the quantity varied from 3,500 cwts. to 1800 cwts., and the value from £65,000 to £47,000.—Strips of rattan canes dyed black are used as a cheap kind of artificial whalebone, but the best imitation is made of vulcanite or prepared caoutchouc, which in many respects is superior to the real whalebone.

WHALE-LOUSE, *Cyamus*, a genus of crustacea, of the order *Ammodipoda*, having the body short and rather broad; the legs short and stout; seven pair of legs; the first pair more slender than the rest; the first, second, fifth, sixth, and seventh pair furnished with sharp hooked claws, the third and fourth not terminating in claws, but in a long

almost cylindrical joint. All the species are parasitic on cetacea, attaching themselves to the skin by means of their claws. Whales are sometimes so completely covered with them as to appear of a whitish color even at a distance; and when the whale is captured, its skin is found to be deprived of the epidermis. *Cyamus ceti* is said also to infest the mackerel and other fishes of the family *scomberidae*.

WHANG-HAI', or **YELLOW SEA,** an important inlet of the Pacific ocean, washes the n. part of the e. coast of China, and is bounded on the w. by the Chinese provinces of Shang-tung and Keangsu, on the e. by the peninsula of the Corea and Japan. It terminates on the n.w. in the gulfs of Pe-chih-li and Leaotong, and opens out in the s.e. into the Tung-hai or Eastern sea. It is more than 600 m. long, and over 400 m. in average breadth. The Wang-hai' is shallow, and near the land its waters are of a lemon color, owing to the nature of the bottom, which is often furrowed by vessels navigating it. By degrees it is becoming more and more shallow, owing to the quantity of alluvium borne down into it by the rivers Whang-ho (q.v.) and Yang-tze (q.v.).

WHANG-HO, HOANG-HO, or YELLOW RIVER, one of the principal rivers of China, about 2,400 m. in length, and the area of its basin being not less than 700,000 sq. miles. It rises in a marshy plain lying between the Bayan-kara and Kwanlun mountains, in a lake called Ala-nor, in lat. $35^{\circ} 30'$ n., long. 93° east. Its course is so crooked that after it leaves Ala-nor, it turns first s. 30 m., then e. 160, then westward 120, winding about the gorges of the Kwanlun, then n.e. into the province of Kansuh, next it proceeds northward for 430 m., till it is bent eastward by Inshan, on the edge of the table-land, where it incloses within its great bend the country of the Ortoos Mongols. At the Pehling it is deflected s. where it divides the provinces of Shanse and Shense for 500 miles. At the south-western corner of Shanse, it receives its largest tributary, the Wei-ho, 400 m. in length; from this point the Yellow river flowed until recently eastward to the ocean, 650 m. distant, in lat. 34° . It is little used for navigation, Chinese vessels being unable to stem its impetuous current. In some parts of its eastern course it is above the great plain through which it passes. The embankments requisite for averting inundations are a source of never-ending expense to the government, and their yielding to floods a frequent cause of desolation to extensive districts of country. Dr. Macgowan announced some years ago, in the *North China Herald*, that this wayward and turbulent stream had suddenly shifted its course turning off near Kaifung-foo in a north-easterly direction, discharging its waters into the rivers of Chihle, which disemboque in the gulf of Pehchele, the mountainous province and promontory of Shantung intervening between its former and its present mouth, a distance by coast-line of about 500 miles. More recently, it was announced that the old bed of the Yellow river, for more than 200 m. from its mouth, was a belt of sand, which, since 1853, has been, to use the Chinese term applied to it, "as dry as dust." The change seems to have been gradual. As there were frequent slight shocks of earthquakes in the great plain of China in 1852-53, Dr. Macgowan suggests that these contributed to effect the phenomenon, another cause being neglect of the dykes by the imperial government. There is a bar with only five feet of water across the new mouth of the Whang-ho. Its present channel is probably the same as in ancient times; for it has shifted its bed at different periods of Chinese history. The vast quantity of sediment conveyed to the sea by this river, giving it its color and name, is taken up in that part of its course which lies between the provinces of Shanse and Shense; beyond which its waters are remarkably clear. Whang-ho is held in great veneration by the Chinese.

WHARF—WHARFINGER. The space along a harbor or navigable stream, arranged to receive a vessel's cargo is called a wharf. It is usually built out beyond the lowest ebb of the tide, so that vessels may come up along-side, and discharge or receive cargo. A wharf is commonly built by driving down piles and covering them with plank. At common law, the soil of tide waters below high-water mark belonged to the crown; in this country it belongs to the states, who have the power of regulating the erection and use of wharves. A wharf built without the sanction of the state, is a public nuisance. But the right may be granted to others; thus, the shore of Manhattan island has been ceded to the city of New York by the state of New York. The person who is the owner or keeper of a wharf is called a **WHARFINGER**. His liability is that of an ordinary bailee for hire. His charges for landing or loading goods are called wharfage. Being matters of public interest, wharfage rates can be regulated by statute. A wharfinger has a lien on the goods for his balance.

WHARNCLIFFE MEETING. By a standing order of the house of lords, which was proposed by lord Wharncliffe, and is still known by the title of the "Wharncliffe order," no bill to empower any company already constituted by act of parliament to execute, undertake, or contribute toward any work other than that for which such company was originally established, or to sell, lease, or abandon its undertaking, or any part thereof, or to amalgamate with any other undertaking, or to dissolve, is allowed to proceed in the house of lords until it is reported that such bill has been submitted to a special meeting of the proprietors of the company, convened by public advertisement, and by circular addressed to each proprietor; that such meeting was held not earlier than seven days after the last insertion of such advertisement; and that at such meeting the bill was submitted to the proprietors present, and approved of by proprietors present, in person

or by proxy, holding at least three fourths of the paid up capital of the company represented at such meeting. Of late years, a number of bills are in each session originated in the house of lords; and since the introduction of this practice, the meetings held in conformity with this order are popularly known as "Wharnclyffe meetings." The house of commons has adopted a corresponding standing order applicable to such bills coming from the lords.

WHARTON, a co. in s.e. Texas, having the San Bernard river on the n.e., drained by the Colorado; 1094 sq.m.; pop. '80, 4,549—4,379 of American birth, 3,632 colored. Co. seat, Wharton.

WHARTON, FRANCIS, D.D., LL.D., b. Philadelphia, 1820; graduated, Yale college, 1839; practiced law, Philadelphia; prof. of logic and rhetoric in Kenyon college, Ohio, 1856-63; rector of St. Paul's church (Pret. Episcopal), Brookline, Mass., 1863; prof. in Cambridge Episcopal seminary, 1866; editor of *Episcopal Recorder*. He published a *Treatise on the Criminal Law of the United States*; *Treatise on Medical Jurisprudence*; *State Trials of the United States during the Administrations of Washington and Adams*; *Treatise on the Law of Homicide in the United States*; *Treatise on Theism and Modern Skepticism*. He has contributed to many periodicals, and edited volumes of law reports.

WHARTON, HENRY, 1664-95, b. Norfolk, England; graduated at Cambridge university, 1684. He took orders in the church of England and was assistant to Cave in the compilation of the *Scriptorum Ecclesiasticorum Historia Literaria* (1688). He also wrote several biographical and theological works, the best known of which is *Anglia Sacra*.

WHARTON, PHILIP WHARTON, Duke of, was the son of Thomas, marquis of Wharton, an eminent member of the whig party in queen Anne's reign, and lord-lieutenant of Ireland from 1708 until after the fall of the Godolphin administration in 1710. Macaulay says he was licentious and corrupt; but the faults of his Irish administration were largely redeemed by his appointment of Addison as chief-secretary. George I. made him lord-privy seal and marquis of Wharton in 1715, but he died three months afterward. His son, Philip, born 1698, was educated at home by his father, who aimed at making him a great orator, a whig in politics, and a Presbyterian in religion. In a boyish freak, he contracted a clandestine marriage at the Fleet with the daughter of maj.gen. Holmes. The shock is said to have killed both his parents. Wharton soon parted from his wife, and in 1716 went abroad with a French Huguenot tutor, to be brought up according to his father's dying instructions, in strict Presbyterian principles, at Geneva. He contracted debts, spurned the restraints of his tutor, and ran away to Lyons. He visited the pretender at Avignon, and, it is said, accepted from him the title of duke of Northumberland. He next visited Paris, and, after various extravagances, set out for Ireland, where, although he had not yet reached his 19th year, he was allowed to take his seat in the house of peers. He soon displayed such splendid abilities in debate, and supported the government with so much zeal, that, although still under age, he was, Jan. 20, 1718, raised to the highest rank in the English peerage. He did not take his seat in the English house of peers until 1720. Here he opposed with much warmth the government measure on the South sea bill, and the bill of pains and penalties against bishop Atterbury. His affairs became hopelessly involved by his extravagance, so that although he had succeeded to an estate of £16,000 a year, he was soon compelled to accept a yearly allowance of £1,200 from his creditors. He set up a political paper, called the *True Briton*, in 1723; and lost no occasion of speaking, as well as writing, against the ministry and the court. In 1724 he set out for Vienna, and then visited Madrid, where he was served with an order from the privy seal to return home. He treated the order with contempt, and afterward went to Rome, and appeared openly at the court of the pretender, from whom he accepted the order of the garter. He now assumed the title of duke of Northumberland. In 1727 he fought with the Spaniards and against his countrymen at the siege of Gibraltar. This last mad act lost him his English title and estates, and led to his conviction under a bill of indictment for high treason. He refused to make his submission to the government; and the rest of his life was passed in France and Spain, at one moment squandering his precarious supplies of money in drunkenness and luxury, and at another suffering the extremest poverty. He died in a miserable condition at a Bernardine convent in Catalonia, May 31, 1731. His brilliant talents and wasted life were sketched by Pope in his Moral Essays, in the lines beginning—

Wharton, the scorn and wonder of our days.

The *Life and Writings of Philip, late Duke of Wharton*, were published in 1732 (Lond. 2 vols. 8vo); and another two-volume publication, entitled *The Poetical Works of Philip, late Duke of Wharton, and of the Duke's Intimate Acquaintance*, appears, with the exception of the title-page and a prefixed biography of Wharton, to have been printed in 1727. This publication, however, contains little that is even attributed to the duke.

WHATCOM, a co. in n.w. Washington territory, having the gulf of Georgia for its w. boundary, drained by the Skagit river, containing mount Baker, a peak of the Cascade range, 10,000 ft. in altitude; 2,600 sq.m.; pop. '80, 3,137—2,232 of American birth, 369 colored.

WHATELY, RICHARD, Archbishop of Dublin, was born in Cavendish square, London, Feb. 1, 1787, and was the fourth son of Dr. Joseph Whately of Nonsuch park, Surrey, prebendary of Bristol, vicar of Widford, and lecturer at Gresham college. He was sent in due time to a private school at Bristol, from which, in 1805, he passed to Oriel college, Oxford. He took his bachelor's degree in 1808, taking a second class both in classics and in mathematics. He got the English-essay prize in 1810. In the following year he was elected a fellow of Oriel college, which at that time ranked among its fellows not a few men destined to play a considerable part in the world, and already remarkable for their attainments and intellectual activity—e.g., Arnold, Keble, Pusey, and the elder Newman. In 1815 he became one of the tutors of his college; and about this time he wrote (originally for the *Encyclopædia Metropolitana*) what he afterward expanded into his popular treatises on logic and rhetoric. In 1821 he married a daughter of W. Pope, esq., of Hillingdon, Middlesex. In the same year he published two works; the one a volume of sermons on *The Christian's Duty with respect to the Established Government and the Laity*; the other a work which is among, the most celebrated and characteristic of his writings; this was *Historic Doubts relative to Napoleon Bonaparte*. Its object was to throw ridicule upon the criticism to which the Gospel narratives were subjected by skeptical writers, by applying the same kind of criticism to events within the memory of all the world, and starting doubts as to whether these events had occurred. This *jeu d'esprit* with a purpose created a great sensation. It has been translated into several foreign languages. In 1822, Whately was presented to the living of Halesworth, in Suffolk. In the same year he delivered the Bampton lectures at Oxford, taking for his subject the "Use and Abuse of Party Feeling in religion." In 1825 he was appointed by lord Grenville principal of St. Alban's hall, which, under his energetic rule, quickly lost the bad character it had long sustained in the university. In 1829 he was appointed professor of political economy; but he was destined not to hold this office long enough to do more than deliver an introductory course of lectures. In 1831 lord Grey's government, at the instance of lord Brougham, appointed him archbishop of Dublin and bishop of Glendallach. Afterward, in 1846, his episcopal charge was enlarged by the addition of the bishopric of Kildare.

During the ten years preceding his appointment to the archbishopric, Whately had been incessantly writing and publishing, chiefly upon theological and ecclesiastical subjects. He belonged to the liberal school in religion and in politics; he was opposed, that is, to high church or Catholic views in theology, and to toricism in politics. He had taken a keen interest in the political questions of the time, and especially had made himself conspicuous in the university by his advocacy of Catholic emancipation, of which the party in the church which had most sympathy with the theology and ecclesiastical system of the Roman church were the most determined opponents. When sir R. Peel, after his change of views on the emancipation question, voluntarily submitted himself for re-election to the university, Whately, though a liberal, came forward to support him, and was one of the most active of those who endeavored to prevent his rejection. His *Essays on some of the Peculiarities of the Christian Religion* appeared in 1825; his *Elements of Logic*, in 1826; the *Elements of Rhetoric*, in 1828; his *Essays on some of the Difficulties in the Writings of St. Paul*, etc., also in 1828; his *Thoughts on the Sabbath*, in 1830; and in the same year, the *Errors of Romanism traced to their Origin in Human Nature*. His *Introductory Lectures on Political Economy* were published in 1831. By this time his writings, and the great activity and ability which he displayed in his various public functions, had placed him among the foremost men of the university, and had also got him rank among the most remarkable thinkers and writers of his time. Though many distrusted him as a liberal, questioned the soundness of some parts of his theology, or thought his manners too eccentric, and his habit of mind too peculiar, for one who was to rule over others, nobody questioned that his abilities and reputation were equal to the high position bestowed upon him by lord Grey.

As archbishop of Dublin, Whately was very active in all matters of importance, social and ecclesiastical, and showed a deep interest in every question affecting the welfare of Ireland. He was one of the original members of the board of national education, and continued a member till 1853, when he retired, in consequence of a departure, as he thought, having been made from the principles on which, up to that time, the national education had been carried on. He was perhaps the most active member of the board, and the success of the national system was in a great measure owing to him. He and members of his family were always foremost in supporting well-devised charitable schemes. His liberality was, in fact, unbounded, though an opposite impression prevailed among those who did not know him, because he wrote and spoke strongly against casual benevolence, and used to say he had never given a penny to a beggar. As archbishop, his rule was firm and judicious. A slight disregard of etiquette was about the worst thing ever alleged against him: he was not disposed to make much difference between a rector and his curate. His activity as an author was not stifled by his energetic discharge of his public duties; indeed, he seems to have been always either writing a book, or affording literary help to others. Besides many charges, sermons, and a few pamphlets, his *Kingdom of Christ, Delimited*, one of the most remarkable of his works; his *Introductory Lectures to the Study of St. Paul's Epistles*; his *English Synonyms*; and his annotated edition of Bacon's *Essays*—perhaps the best example of good editing in the English

language—belong to this period of his life. A work published anonymously in 18 , *Scripture Revelations respecting Good and Bad Angels*, has been generally ascribed to Whately.

He died on Oct. 8, 1863. The world's esteem and the regard of his friends for him had been growing to the last. In early life, there was much about him to shock the fastidious, and some things which might hurt the sensitive; but his peculiarities softened and wore off as he advanced in years. At Oxford he was noted for his rough unceremonious manners, for which (together with his dress) he was nicknamed the white bear; and for the plain speaking and rough ridicule with which he would overwhelm an opponent in an argument. He was remarkable, too, for his fondness for athletic sports, which he indulged with a perfect indifference to the minor proprieties. He used to say that his abrupt and careless and seemingly unfeeling ways were a recoil from the painful shyness for which he had been remarkable in his youth. Those who knew him, however, made light of his peculiarities; and few things about him are more pleasing than his firm belief in the merits of his friends, and the number, the warmth, and the permanence of his friendships. He had great talents for conversation, and was famous for his bon-mots, happy repartees, and conversational pleasantries of every kind. His writings are not so much remarkable for subtlety of thought or novelty of view as for strong logic, acuteness, felicity of arrangement and exposition, and the frequency and homely force of his illustrations. He had the happy power of building up materials which might be old into a new, commodious, and almost a beautiful structure. He did nothing for mere ornament's sake: though his imagination was abundantly fertile, it was used only to illuminate his argument; his images are seldom impressive for their beauty, though admirably fitted for didactic purposes. His theological works have been charged with a "cold rationalistic" tendency, and with being wanting in reverence; and it has been inferred, though perhaps too hastily, from some passages in his writings, that he was heretical on the subject of the Trinity. The *Historic Doubts*, the *Essays on the Peculiarities of the Christian Religion*, the *Errors of Romanism*, and the *Kingdom of Christ*, are perhaps the most valuable and characteristic of his writings.—The *Life and Correspondence of R. Whately, D.D., etc.*, by his daughter, E. Jane Whately, was published at London in 1866. It is an interesting, though in some respects a partial, and in some degree an inadequate, memorial of Dr. Whately. As might be expected, the "white bear" side of his character is kept in the shade: but few examples are given of the coarse but racy conversational wit which was one of the archbishop's claims to distinction among his contemporaries. And it is scarcely possible to gather from it what his exact position was in theology or in literature, though the letters, which form a great part of it, give a very fine impression of the qualities which distinguish his works.

WHEAT, the most valuable, and, next to maize, the most productive of all the cereal grasses. The genus *tritium*, of which the species are popularly known either as *wheat* or *wheat-grass*, is distinguished by a spike with many-flowered spikelets, without stalks, and seated one on each notch of the rachis, their sides directed to the rachis, which is zigzag; and two glumes, of which the lower is either awned or awnless; the outer paleæ of each floret having at the top a notch, in the center of which is the terminal point, sometimes prolonged into an awn, or, in some species, with many florets tapering into an awn without a notch. A number of species are found in Britain, of which *T. repens*, well known as couch grass (q. v.), is the most common; but the seeds of none of them are of any value. The native country of the cultivated wheat has generally been supposed to be the central part of Asia; but a discovery was made not many years ago by M. Fabre of Agde, in the s. of France, that the *agilops ovata*, a grass of the regions near the Mediterranean, and of the w. of Asia, becomes transformed by cultivation into wheat. The announcement of this discovery was at first received with much doubt, although the possibility of the transformation had been suggested by previous botanists; but it has been confirmed by subsequent observations and experiments. The genus *agilops*, as hitherto recognized by botanists, is distinguished from *tritium* chiefly by its more numerous awns, the glumes of *Æ. ovata* being generally terminated by 3 or 4 awns, prolongations of their ribs, and the paleæ by 2 or 3 short awns. The awns of grasses, however, afford very uncertain characters, being extremely liable to disappear through change of circumstances; and among the cultivated varieties of wheat, every farmer is familiar with some that are awned or *bearded*, and some that are beardless, having scarcely a trace of awn. In the wild *agilops*, the ear is also much more easily broken from the rachis than in wheat. In cultivation, the *Æ. ovata* very soon loses the awns of its paleæ and of the lateral ribs of its glumes, and thus assumes the characters of wheat, the ears at the same time losing their fragility, the grain also increasing in size, while the floral envelopes are proportionally diminished, the leaves become larger, and the stem stronger. From seeds of the *Æ. ovata* sown in a garden in 1838, M. Fabre obtained wheat of fair quality in 1846. Prof. Buckman, of the royal agricultural college, repeated the experiment in England. His first sowing was in 1855, and notwithstanding the disadvantages of cold seasons and a cold situation on the Coteswold hills, he found the spikelets much modified in 1859, the warm summer of that year producing a greater change than had taken place in previous years (see *Popular Science Review* for October, 1861). The identity of the principal cultivated forms of *tritium*

with *T. orata* may now be regarded as fully established. These forms have generally been included by botanists under the name *T. vulgare*.

Wheat has been cultivated from the earliest ages, and was a chief crop in ancient Egypt and Palestine, as it still is in all the temperate parts of Europe, Asia, and Africa. It is cultivated to a considerable extent in the n. of India. In North America it is very extensively cultivated, and many parts of the United States and British provinces are admirably adapted to it. Wide regions of South America are equally suitable, and wheat of the finest quality is produced in Australia. In the torrid zone, wheat does not succeed, except in elevated situations; but it nowhere succeeds better than in sub tropical regions, although it is a hardy plant, and when covered by snow, endures even very severe winters in the n. of Europe. For its successful cultivation, however, it requires a mean temperature of at least 55° Fahr. for 3 or 4 months of the year. It is an annual plant, and its capacity of enduring the cold of winter is of importance only in connection with the advantage to be derived from sowing in autumn, so as to have it more forward in spring. Its cultivation does not extend so far n. as that of barley or oats, or even of rye. In Europe, its northern limit is about lat. 60°. The quality of the grain varies much in different soils and climates, and particular varieties are also distinguished by difference of quality as well as by external characters. The wheat of the eastern parts of Britain, where the climate is comparatively dry, is superior to that of the western parts, where the sky is more cloudy and the climate more humid, although the crops in the west are not less luxuriant; and the wheat produced in Britain is not found suitable for the manufacture of macaroni, to which that of the countries near the Mediterranean is particularly adapted. Although hardy in winter and early spring, wheat becomes more delicate and susceptible of climatic influences as it advances in growth; a prevalence of dry weather, with bright sunshine from the time when it comes into ear until it is ripe, is of the greatest importance.

COMMON WHEAT, *T. vulgare*, *astivum*, or *sativum*, grows to a height generally of 3 or 4 ft., and has ears or spikes generally 3 or 4 in. long; the spike 4-cornered, the spikelets about 4-flowered; the paleæ ventricose, ovate, truncate, mucronate or awned, compressed under the point, rounded at the back, the grain free. In consequence of long cultivation, in a great variety of climates, the cultivated varieties of wheat are very numerous, more so than in any other kind of grain. New varieties are continually coming into notice; and many are in high estimation in particular districts, although little known beyond them. Some botanists have attempted to distinguish species among them, appropriating the name *T. astivum* to the awnless kinds, and *T. hybernium* to the awned; but intermediate forms are very numerous, and the length or shortness of the awn seems to depend upon accidental circumstances. Nor do the awnless or beardless kinds perfectly correspond with the summer wheat of farmers, preferred for sowing in spring with a view to a crop in the same season, and the awned or bearded kinds to the winter wheat, sown in autumn, as some of the hardy varieties of winter wheat are awnless, and some of those usually sown in spring are bearded. Besides being classified as bearded and beardless, the varieties in cultivation are also distinguished according to the color of the grain, as *white* and *red* wheats. Some having the ears covered with a short soft down are known as *woolly* wheats. There are also differences in the length and compactness of the spike, and in the size and form of the grain, which is more rounded in some, and more elongated in others. A number of varieties, having the spike very compact or square, have been sometimes classed together under the name of *T. compactum*, and the distinction is very obvious and permanent, although there is no reason for regarding it as characterizing a distinct species. Akin to this is the MUMMY WHEAT (*T. compositum*), in which the spike is branched, and which is said, but on insufficient evidence, to have been produced from seeds found in mummy-cases in Egypt. Mummy wheat has been grown in England, of which the ears have had 10 or 11 branches, and 150 grains have been found in one ear; while 60 ears have been produced by a single seed. Notwithstanding these apparent advantages, however, this variety does not serve the purposes of the farmer so well as some others. In another group of varieties with compact ears (*T. turgidum* of some botanists), the glumes are remarkably tumid, and always awned. These are known by the names of *gray* wheat, *Pollard* wheat, *duckbill* wheat, etc., and in Germany are commonly called *English* wheat. *Polonian* wheat (*T. Polonicum*) is the common name of a number of kinds of a very peculiar appearance, with a long, loose, and somewhat nodding spike: the glumes awned, and remarkably long—twice the length of the florets. The stems are also very tall, sometimes more than 6 ft. high. These kinds, sometimes called *Grecian* or *Mogadore* WHEAT, are cultivated in some parts of the s. of Europe, in the s. of Siberia, and in Africa. HARD WHEAT, or HORNY WHEAT (*T. durum*), has rather small, elongated, and very hard grains, the paleæ have remarkably long awns, and the leaves are very broad. It is much cultivated in the countries near the Mediterranean, and Dr. Royle suggests that it would be a valuable acquisition to India, as it yields a good crop on comparatively sterile soils.

The red varieties of wheat are generally more hardy than the white; the grain is inferior in quality, and yields less flour, but these disadvantages are more than counterbalanced in many soils and situations by the greater productiveness of the crop. Red wheats are therefore preferred for comparatively poor soils, but the white kinds are gen-

erally cultivated wherever the soil and climate are suitable. The varieties with long straw yield the best crops in dry seasons, but the short-strawed kinds are best when the season is wet. Wheat is particularly suited to clay soils, and rich heavy loams; but with good farming, excellent crops are produced even on light sandy or gravelly, and on chalky soils. Where the climate is moist, a light dry soil is most suitable; soft deep soils being productive chiefly of straw. The land intended for wheat must, at least in Britain, be in a high state of cultivation. Wheat is commonly sown after green crops, beans, or bare fallow; in the s. of England, often after grass or clover. It may be sown, at least in autumn or the beginning of winter, when the ground is so saturated with moisture, that any other kind of grain would be almost sure to perish. It is either sown broadcast or in drills, and the practice of drilling becomes more and more prevalent, both on account of the saving of seed and the superiority of the crops produced. The land prepared for wheat is very often manured with farm-yard manure; artificial manures—as guano—are also used. In Scotland, it is a common practice, when wheat is to be grown after turnips, to plow down the turnip-leaves in autumn before the wheat is sown, and to apply guano in spring. Nitrate of soda is another favorite top-dressing for wheat, but sometimes causes the plants to grow too rapidly, so that they become tender, and suffer from climatic influences. Many farmers use both guano and nitrate of soda for top-dressing wheat, and the nitrate of soda is often mixed with common salt, which is thought to be useful in giving strength and vigor to the wheat plants, preventing lodging and mildew. Wheat ought to be reaped before it is *dead ripe*, unless when it is intended for seed, and it ought to be stacked as soon as it is sufficiently dry to be free from danger of heating. On very rich land wheat sometimes becomes too luxuriant in spring, and its growth needs to be repressed by cutting the leaves with a scythe—a practice essentially agreeing with that mentioned by Virgil in his *Georgics* (i. 111), of allowing cattle to feed upon the young blades:

Quid, qui, ne gravidis procumbat culmus aristis,
Luxurium segetum tenera depascit in herbâ,
Quum primum sulcos aequant sata?

The relative proportions of straw and grain differ very much in different varieties of wheat, and according to differences of soil, climate, and season. The proportion of the weight of grain to that of the whole plant when dried so as to be ready for stacking, varies from 20 to 47 per cent. The composition of the grain itself varies considerably, as to the proportions of starch, gluten, etc., which it contains. One hundred parts of the grain of wheat, dried in the ordinary manner, contain on an average—water, 14.83; gluten, 19.64; albumen, 0.95; starch, 45.99; gum, 1.52; sugar, 1.50; oil, 0.87; vegetable fiber, 12.34; ash, 2.36; total, 100.00.

The ash is rich in phosphoric acid, magnesia, and potash. Its composition is as follows: Potash, 29.97; soda, 3.90; magnesia, 12.30; lime, 3.40; phosphoric acid, 46.00; sulphuric acid, 0.33; silica, 3.35; peroxide of iron, 0.79; chloride of sodium, 0.09; total, 100.00. For the processes by which starch and gluten are obtained from wheat, see these articles.

The value of wheat depends mainly on the quantity of fine flour which it yields; the best wheat yielding 76 to 80 per cent, sometimes even 86 per cent, of fine flour, whereas inferior kinds seldom yield more than 68 per cent, and sometimes only 54 to 56 per cent. In general, the smoother and thinner the grain is in skin, the greater is the produce of fine flour. The greater part of the husk of wheat is separated from the flour by the miller, and is known as *bran*. That portion of the bran which is more finely divided than the rest receives the name of *sharp* or *pollard*. See the articles BRAN and FLOUR.

Wheat-straw contains, on an average, in its ordinary state of dryness—nitrogenous substances, 1.85; non-nitrogenous substances, 67.56; mineral substances, 4.59; water, 26.00; total, 100.00; and the composition of the ash is as follows: Potash, 12.14; soda, 0.60; magnesia, 2.74; lime, 6.23; phosphoric acid, 5.43; sulphuric acid, 3.88; silica, 67.88; peroxide of iron, 0.74; chloride of sodium, 0.22; total 100.00.

The principal diseases to which wheat is subject, some of which are often productive of great loss to the farmer, are either owing to or connected with the presence of parasitic fungi. See BRUNT, MILDEW, RUST, and SMUT. An animalcule causes the disease known as ear-cockles (q.v.). Wheat suffers also from the ravages of numerous species of insects.—See HESSIAN FLY, WHEAT-FLY, CORN-MOTH, and WIREWORM. The larva of a ground beetle (*zebrus gibbus*) is often very destructive to young wheat in winter and spring.

SPELT (*triticum spelta*) is regarded as a distinct species from common wheat, and is supposed to be a cultivated form of *agilops caudata*, a native of the countries near the Mediterranean. The spikelets are smaller than in common wheat, and each spikelet has two or three, rarely four, perfect florets, besides a barren terminal one; the outer glumes and the paleæ are very broadly truncate at the top, and notched; the awns very slender; the ripened grain adheres closely to the paleæ or chaff. Spelt is supposed to be the grain called *zea* by the Greeks and *far* by the Romans. It is of little value in comparison with wheat, but can be grown on inferior soils, and is cultivated in Switzerland, at an elevation where wheat would not succeed. The bread made of it is coarse, and is used chiefly by the poorer classes.—Another species sometimes called LESSER SPELT, or ONE-GRAINED WHEAT (*triticum monococcum*), is also occasionally cultivated on poor soils, and in elevated situations in the center and s. of Europe. It is sometimes called

St. Peter's corn. The ear is small and compressed, the spikelets contain only one perfect floret and a rudimentary one; the awns are long; the grain is small, and adheres closely to the chaff.—*Triticum Bengalense* may be regarded as a kind of spelt. It has remote spikelets, long awns, and long irregularly triangular grains. It is cultivated to some extent in India.

Wheat being the most esteemed of all the cereals, particularly for the making of bread, the increase of its cultivation and use has marked the progress of agriculture and of wealth in many countries, and particularly in Britain. It is only of late that bread made of wheat has become a common article of food among the laboring classes in Britain. In some parts of the country, it is still, indeed, far from being a principal article of food among the peasantry, who use barley and oats in various forms. In the 8th c., the monks of the abbey of St. Edmund, in England, ate barley-bread, because the income of the abbey would not admit of their using wheaten bread regularly. At a later period, wheat was largely used, at least in the southern parts of England, for a short time after harvest, but the supply was soon exhausted, and recourse was again had to inferior kinds of food. There was then no trade in corn to equalize the price over the year. In 1317, when an abundant harvest had been gathered in, the price of wheat fell at once from 80s. to 6s. 8d. per quarter. The rejoicings of harvest-home were, therefore, in these times connected with a transition from poor to good fare, and from comparative want to abundance, such as happily does not attend the same occasion in our day. Down to the end of the 17th c., wheaten bread was a principal article of food only among the more wealthy; and the servants in their houses were still furnished with oats, barley, and rye. In the northern parts of England, as well as in Scotland, the use of wheaten bread was comparatively rare even at the middle of last century. "So small was the quantity of wheat used in the county of Cumberland," says Eden, in his *History of the Poor* (1797), "that it was only a rich family that used a peck of wheat in the course of the year, and that was used at Christmas. The usual treat for a stranger was a thick oat-cake (called *haver-bannock*) and butter. An old laborer of 85 remarks that when he was a boy he was at Carlisle market with his father, and wishing to indulge himself with a penny loaf made of wheat-flour, he searched for it for some time, but could not procure a piece of wheaten bread at any shop in the town." At the period of the revolution, 1689, the quantity of wheat grown in England was estimated at about 14,000,000 bushels, or about three bushels to each of the population, which was then under five millions. In 1828 about 100,000,000 bushels were produced, or about seven bushels to each of the population, then under fifteen millions (see *Library of Entertaining Knowledge; Vegetable Substances used for the food of Man*, Lond. 1832). In 1878 there were 3,143,054 acres under wheat in England and Wales, and 75,363 acres in Scotland, the produce of which may be estimated at about 100,000,000 bushels; besides which, a very large quantity of wheat is imported from other countries. The cultivation of wheat now extends to the most northern parts of Scotland, 3,164 acres having been under this crop in 1878 in the county of Elgin, and 4,162 in Ross and Cromarty, and even in Sutherland 91, and in Caithness 7 acres. The population of England and Scotland being now about 26,000,000, it appears that the quantity of home-grown wheat consumed amounts to nearly 4 bushels for each of the population; but the wheat imported in 1875 amounted to about 72,000,000 bushels; raising the amount consumed to nearly 7 bushels per head of the population. Ireland is left out of account, as not being to a great extent either a wheat-growing or a wheat-consuming country. The produce per acre is greater in Britain than in any other wheat-growing country, owing to superior farming, notwithstanding disadvantages of climate and often of soil. The extent of land now under wheat has, however, of late years diminished, owing to the foreign supply, and the high price of butcher-meat making pasturage now profitable. The quantity of wheat produced in the United States in 1877 was estimated at about 365,094,800 bushels. The chief wheat-growing states and their production in 1873 were—Iowa, 34,600,000 bushels; Illinois, 28,417,000 bushels; Minnesota, 28,056,000 bushels; Wisconsin, 26,322,000 bushels. The progress of wheat-cultivation in the western states has been extremely rapid. Iowa now produces more wheat than any other state of the union. In 1821 the total exports of wheat from the United States were valued at \$178,314, and of wheat-flour at \$4,298,043. The total exports of wheat in 1878 were valued at \$96,872,016, and of wheat-flour at \$25,092,826. This rapid increase is due to the increase of wheat-culture in previously unsettled regions. The greater part of the wheat exported from North America is to Great Britain. Of the wheat imported into the United Kingdom in the year 1875, the United States contributed 45 per cent; Russia, 18 per cent; Germany, 12 per cent; British North America, 7 per cent; Egypt, 4 per cent; France, 2½ per cent; and Turkey, 2½ per cent.

WHEATEAR, or FALLOW-CHAT, *Saxicola oenanthe*, a bird of the genus popularly known by the name chat (q.v.), of the family *sylviade*, a common summer visitant of Britain, abounding on downs and fallow fields. Its geographic range is wide. Its winter retreat is in the countries near the Mediterranean, and chiefly in Africa; its summer migrations extend to the furthest n. of Europe, and to Iceland and Greenland. A few wheatears spend the winter on the southern coasts of England. The entire length of the wheatear is about 6½ in.; the tail is almost square; the wings are long and pointed; and the legs are long, enabling the bird to hop about actively in quest of food. Its food consists of worms and insects, and it may often be seen perched on the top of a clod or stone, look-

ing out for them, and at the same time on the watch against enemies. The male is of an ash-brown color on the upper parts; the forehead, a band above the eyes, and the throat, white; a black mark extending from the base of the bill to each eye, and expanding behind it, so as to cover the orifice of the ear; the wings, black; the rump, and two-thirds of the tail, except the two middle feathers, white; the tip of the tail, black; the two middle feathers of the tail, entirely black; the breast, buff-color; the belly and flanks, pale buffy white. The female is less gayly colored, brown and gray prevailing. The wheatear makes its nest in an old wall, or in a crevice of a quarry or gravel-pit, often in a deserted rabbit-burrow, and generally lays six pale-blue eggs. The male has a pleasant, but not loud song, and sings well in confinement, in winter as well as in summer. This little bird is much esteemed for the table, and great numbers are therefore annually caught, not only on the continent of Europe, but in England, where comparatively few small birds are sought after for such use. It is chiefly on the downs of the s. of England, where vast flocks congregate before their autumn migration, that wheatears are caught for the market. The shepherds catch them by means of nooses placed in little excavations made in the ground, advantage being thus taken of the habits of the bird, which upon the least alarm, or even the shadow of a passing cloud, runs to hide itself in any little hollow that may be near. The usual practice of the shepherds is to cut out an oblong piece of turf, about 11 in. by 8, and 6 in. thick, which they lay across the hole that is made, making sloping entrances at the ends of the hole, and setting nooses under the turf in the center. As many as 84 dozen wheatears have been thus caught by a single shepherd in a day. It is not unusual for a shepherd and his lad to look after from 500 to 700 of these traps. The season for catching wheatears extends from the end of July to the end of September. They are partly sent to the London market, but very many are consumed at the watering-places on the Sussex coast.

WHEAT-FLY, the popular name of certain species of dipterous insects, which are often very injurious to wheat crops. One of them, *cecidomyia tritici* (see *CECIDOMYIA*), sometimes called the **WHEAT MIDGE**, and belonging to the same genus with the destructive Hessian fly of America, is too common both on the continent of Europe and in Britain, but fortunately is not very abundant except in particular years. It is supposed to be the same fly which appeared in the n. of New England in 1823, probably imported from the old world, and thence spread into New York and Canada, destroying a tenth part of the wheat-crop for several years, and only disappearing on being starved out by a change of crop, or by late spring-sowing of wheat. The eggs are deposited in the wheat when it is coming into flower, and the larvæ abstracting the juices, cause the grain to shrivel. The perfect insect appears in June, when great numbers may sometimes be seen on wing in the evening, their chief time of activity. It is about one-tenth of an inch in length, pale ochereous or orange, downy, with large black eyes, and long slender legs; the male with very long antennæ. The antennæ of the male differ much in structure from those of the female, and are of twenty-five joints, while those of the female have only thirteen. The larvæ are small and lemon-colored. A little black ichneumon lays its eggs in the larvæ of the wheat-fly, and is thus useful to the farmer by destroying it.—The name wheat-fly is also given to species of the genus *chlorops* (see **CORN-FLY**), destructive to wheat.

WHEATLEY, PHILLIS, 1753-94; a native of Africa; was brought to this country in 1761; purchased by Mrs. Wheatley of Boston, and by her well educated. When yet a girl she wrote many verses, and in 1773, when she was on a visit to England, was published her *Poems on Various Subjects, Religious and Moral*, by Phillis Wheatley, Negro Servant to Mr. John Wheatley of Boston, in New England. The book was reprinted in Boston.

WHEATON, FRANK, b. R. I., 1833; became a civil engineer, and from 1850 to 1855 was engaged in the boundary surveys of Mexico and California. In 1855 he became a lieutenant in the cavalry and took part in the fort Kearney fight with the Cheyennes. In 1861 he was made lieutenant-col. of volunteers, and was present at the battles of Bull Run, Antietam, Fredericksburg, Gettysburg, Harper's Ferry, the Wilderness, Spottsylvania, and others. He commanded a division at Cedar Creek and elsewhere. At the end of the war he was lieutenant-col. in the regular army, and brevet brig. and maj. gen.

WHEATON, HENRY, American jurist and diplomatist, was b. at Providence, R. I., Nov. 27, 1785, educated at Brown university; admitted to the bar in 1802; after which he spent several years in France, and six months in London, engaged in legal and literary studies. On his return to America, he resided in New York, where he contributed papers on international law to the *National Advocate*, a daily newspaper, and was appointed a justice of the marine court. In 1815 he published a *Digest of the Law of Maritime Captures or Prizes*, which has been commended as one of the best works in English on the subject. About the same time he published an *Essay on the Means of maintaining the Commercial and Naval Interests of the United States*. In 1816 he was appointed reporter of the proceedings of the supreme court of the United States, a post he filled until 1827. His reports, filling twelve volumes, a distinguished German has called "the golden book of American law;" and it is considered by the legal profession as a work of extraordinary ability and value. He also made frequent contributions to the *North American* and *American Quarterly Review*, and delivered addresses before literary societies. In 1825 he was engaged in revising the statute laws of New York; in

1826 he wrote his *Life of William Pinckney*, of which he furnished an abridgment for Sparks's *American Biographies*. In 1827 he was appointed *chargé d'affaires* to Denmark, and resided at Copenhagen till 1835, when he was appointed resident minister at Berlin, and in 1837, minister plenipotentiary, which post he occupied with distinguished credit until 1846. In 1831 his *History of the Northmen* appeared at Philadelphia, London, and Paris; in 1836, his *Elements of International Law*; in 1841 his *Essay*, for which he received the prize of the French institute, entitled *L'Histoire du Droit des Gens en Europe, depuis le Paix de Westphalie jusqu'au Congrès de Vienne*, which, in 1846, was published, greatly enlarged, in Leipzig and Paris, and an English translation in New York. This work is a standard authority, and its author received the highest honors from the learned societies of Europe, and his own countrymen. Having retired from political life, he died at his residence at Dorchester, Mass., Mar. 11, 1848.

WHEATSTONE, Sir CHARLES, physicist and electrician, was b. at Gloucester in 1802. From school he went to the making of musical instruments, and afterward entered into business on his own account in London. But he was no ordinary manufacturer; the scientific principles involved in the construction of instruments occupied his thought; he made many improvements, and in 1823 published a paper entitled *New Experiments on Sound*. Endowed with remarkable ingenuity, he produced numerous models and apparatus to illustrate the phenomena of acoustics and of light, his attention having been drawn to the latter by the analogies between the two subjects. Few men have done so much toward enabling the student to apprehend the principles on which scientific theories are based, particularly those of the undulatory theory of light.

In 1833 Mr. Wheatstone communicated his first paper, *On Acoustic Figures*, to the Royal society; followed in 1834, by *Experiments to Measure the Velocity of Electricity*, in which, with a mirror revolving 800 times in a second, he demonstrated the velocity at 288,000 m. in a second—greater than that of light. In the same year he was appointed professor of natural philosophy in King's college, London. In 1836 he was elected a fellow of the royal society; and in a course of lectures at the college on the velocity above referred to, he anticipated the electric telegraph by experimenting through 4 m. of copper wire. In May, 1837, a patent was taken out in the joint names of Cooke and Wheatstone, "for improvements in giving signals and sounding alarms in distant places by means of electric currents transmitted through metallic circuits." From this instrument, which had five needles, has grown that system of electric telegraphs which now ramifies over the length and breadth of the United Kingdom. The first working-telegraph—insulated copper wires inclosed in an iron tube—was constructed on the Blackwall railway in 1838.

To enumerate the titles only of professor Wheatstone's papers on scientific subjects, and describe his various inventions, would fill many pages; a few only can be indicated here. In a paper on binocular vision laid before the royal society in 1838, he explained the principle of the stereoscope, an instrument of his invention; in 1840 he showed that, by means of electro-magnetism, a number of clocks far apart might be kept going with absolute exactitude from one central clock; and in 1843 he brought out his new instruments and processes for determining the constants of a voltaic series. In 1840, and again in 1843, the royal society awarded him their royal medal—a high acknowledgment of the merit of his researches. For a long time after that date, scarcely a year passed without a paper on some recondite scientific subject, or some new invention, or improvement on former inventions, from the hand of professor Wheatstone, which heightened his reputation, and procured him substantial pecuniary reward. Among his inventions are his cryptograph; his automatic telegraph in two forms; his telegraph thermometer and barometer, by which an observer at the foot of a mountain could read the indications as shown by the instruments on the summit; a machine for the conversion of dynamical into electrical force without the use of permanent magnets, by which large quantities of electricity can be produced at a cheap rate; and an apparatus for conveying instructions to engineers and steersmen on board large steam-vessels.

Professor Wheatstone sat many times on the council, and was a vice-president of the royal society. He was also a corresponding member of the leading foreign scientific academies, and in 1873 he was elected foreign associate of the science department of the institute of France. In 1868 he received from her majesty the honor of knighthood, and in the same year the royal society bestowed on him its Copley medal. He was made LL.D. in 1869 by the university of Edinburgh. He died in 1875.

WHEDON, DANIEL DENISON, D.D., LL.D., b. N. Y.; educated at Hamilton college, and studied law. He was professor of ancient languages and literature in Wesleyan university, Connecticut, 1832-43; became a minister of the Methodist Episcopal church in 1836, and was professor of rhetoric, logic, and history in the university of Michigan, 1845-53. He has been editor of the *Methodist Quarterly Review* since 1856, and resides in New York. He is one of the ablest of American Methodist theologians, and his treatise on the *Freedom of the Will* and his *Commentary on the New Testament* are well known.

WHEEL AND AXLE, the second of the mechanical powers (q.v.), is a modification of the lever (q.v.). Its most primitive form is a cylindrical axle, on which a wheel concentric with the axle, is firmly fastened. When employed for raising heavy weights, the weight is attached to a rope which is wound round the axle, and the power is applied

either to a rope wound round the grooved rim of the wheel, or to a handle fixed at right angles to the wheel's rim (in the latter case, the wheel may be dispensed with, unless it is useful as a conservator of momentum [see FLY-WHEEL], and an ordinary winch substituted). The wheel and axle is neither more nor less than a lever, whose extremities are not points as in the normal form, but the circumferences of circles. Accordingly the power and weight are not attached to particular points in these circumferences, but to cords wound round them, and thus the imaginary simple lever (formed by joining the points where the cords become tangents to the circles), is preserved unaltered in position and magnitude. The conditions of equilibrium are, that P (the power) \times the radius of the wheel = W (the weight) \times the radius of the axle, or, since the circumferences of circles are proportional to their radii, that $P : W ::$ circumference of axle : circumference of wheel. When there is no wheel, but only a winch, the circumference described by the power in one revolution is substituted for the circumference of the wheel. The *capstan* and *windlass* are simple and common examples of this mechanical power, and combinations of toothed-wheels, or of wheels from one to another of which motion is communicated by an endless band, are compound illustrations of the same. See WIND-LASS.

WHEEL-ANIMALCULE. See ROTATORIA.

WHEEL-BREAKING ON THE, a very barbarous mode of inflicting the punishment of death, formerly in use in France and Germany, where the criminal was placed on a carriage-wheel, with his arms and legs extended along the spokes, and the wheel being turned round, the executioner fractured his limbs by successive blows with an iron bar, which were repeated till death ensued. There was considerable variety in the mode in which this punishment was inflicted, at different times and in different places. By way of terminating sooner the sufferings of the victim, the executioner was sometimes permitted to deal two or three severe blows on the chest or stomach, known as *coups de grâce*; and occasionally, in France at least, the sentence contained a provision that the criminal was to be strangled after the first or second blow. Mercy of this kind was, however, not always allowed to be shown to the victims of the wheel; when Patkul, the envoy of Peter the great, was put to death on the wheel by order of Charles XII. of Sweden, it is said that the officer in command of the guard was cashiered by the Swedish king in consequence of having allowed the head to be struck off before life was extinct in the mangled limbs. The punishment of the wheel was abolished in France at the Revolution; in Germany, it has been occasionally inflicted during the present century, on persons convicted of treason and parricide.

WHEEL-WORK. The arrangement for conveying motion from one axis to another by means of toothed-wheels, is familiar to every one; it has been in use since the days of Archimedes, and was in use, probably, for many centuries before; but it is only in modern times that the action of such wheels has been critically examined and understood. To a superficial observer, the action appears to be extremely simple; a tooth of the driver pushes against a tooth of the driven wheel, thereby causing that wheel to turn round; and, since by this turning the teeth must become disengaged, it is requisite that, before one tooth let go, a second tooth of the driver be ready to take hold of another tooth of the driven wheel. For this purpose, it is enough that the distances between the teeth on the two wheels be alike; in other words, that the diameters be proportioned to the number of the teeth.

When two unequal wheels act upon each other, the smaller one turns faster than the larger. Thus, if a wheel with 60 teeth work into one of 20, the latter will turn 3 times as quickly as the former; and it is on this principle that the trains of clock-work are arranged. For example, the *great-wheel* of a common house-clock may have 180 teeth, and may drive a smaller wheel, or *pinion* as it is called, of 15 leaves, and in this case, if the great-wheel turn once in 12 hours, the pinion must turn once in every hour; the axis of this pinion carries the minute-hand. On the same axis the *hour-wheel* is fixed which may have, say, 96 teeth, and may drive a pinion of 12 leaves. This pinion, then, must turn 8 times per hour, or once in $7\frac{1}{2}$ minutes. On the same axis with this last-mentioned pinion there is fixed the *third wheel*, having, perhaps, 75 teeth, and this drives a pinion of 10 leaves, which, turning $7\frac{1}{2}$ times as fast, must make one turn per minute. On the axis of this last pinion the *escape-wheel* is fixed. This escape-wheel has 30 teeth, each tooth acting twice upon the pendulum, thus making 60 beats per minute. In such a case as this, there is no difficulty in arranging the numbers of the teeth, and these may be varied in many ways, provided the proper proportions be kept. But in other cases, a considerable amount of skill, and often a great deal of labor, is required for the discovery of the proper numbers. Thus, if it be wished to indicate the moon's age on the dial of a clock, we must have an index turning once in the time between new moon and new moon. This time, which astronomers call a *lunation*, averages 29 days, 12 hours, 44 minutes, and nearly 3 seconds (2.853), and it is by no means an easy matter to find out what number of teeth will produce this motion. The month-wheel would need to turn rather more than 59 times as slowly as the great-wheel of the clock; and if the mean lunation had been $29\frac{1}{2}$ days, without the odd 44 minutes, the thing could have been managed by making a pinion of 8 teeth lead a wheel of 59 teeth, on the axis of which another pinion, say of 10 teeth is fixed, and made to work a wheel of 50 teeth.

But then such an arrangement would go wrong nearly three-quarters of an hour every month, and in three years would indicate new moon a day too early. In order to obtain a better train, we may compute the number of days in 2, 3, 4, 5 lunations until we get nearly a number of half-days. Now, 16 lunations consist of 472 days, 11 hours, 45 minutes, or almost exactly 945 turns of the great-wheel. This proportion can be obtained by causing a pinion of 12 teeth to lead a wheel of 81 teeth, and another pinion also of 12 teeth to lead a wheel of 105 teeth. This arrangement gives an error of one quarter of an hour in 16 months, or hardly an hour in 5 years. If still greater precision be required, we must carry the multiples further: 33 lunations make 974 days, 12 hours, 13½ minutes, or 1949 turns of the great-wheel of the clock; but then this number 1949 has no divisor, and it is quite impracticable to make a wheel of 1949 teeth; so that we must continue our multiples in search of a better train. In this way, when great exactitude is desired, we often encounter an unexpected amount of labor. For reducing this labor, the method of continued fractions is employed, and the toil is further lessened by the use of tables of divisors.

Such calculations have to be made for the construction of orreries, by which the times of the revolutions of the planets are shown; and engineers have to make them, as when a screw of a particular pitch has to be cut. If, for instance, we have to cut a screw of 200 turns to the French meter on a lathe having a leading screw of 4 turns to the English inch, the axis of the lathe must make 50 turns while the screw makes 39 and a fraction, since the meter is 39.37079 inches. By applying the method of continued fractions, we discover that, for 2,225 turns of the lathe-spindle there must be 1752 turns of the screw; and as these numbers can be reduced into products—viz., 2,225 into $5 \times 5 \times 89$, and 1752 into $2 \times 2 \times 2 \times 3 \times 73$, we can easily get trains to produce the required effect. From these illustrations, it is apparent that the computation of the trains of wheel work is intimately connected with the doctrine of prime and composite numbers.

The general sizes of the wheels and the number of the teeth having been fixed on, the next business is to consider the shape which those teeth ought to have. Now, for the smooth and proper action of machinery, it is essential that the uniform motion of one of the wheels be accompanied by a motion also equable of the other wheel. Two curves have been known to give this quality of equable motion—viz, the epicycloid, formed by rolling one circle upon another, and the involute of the circle traced by the end of a thread, which is being wound upon a cylinder, or unwound from it. But the general character of all curves which possess this property has been only lately examined. If it were proposed to construct two wheels which shall have their centers at the points A and B (fig. 1), and the one of which may make 5 turns while the other makes 3, we should divide the distance AB into 8 parts, and assign 5 of these for AC, the radius of the one wheel, the remaining 3 parts for the radius BC of the other wheel. Wheels made of these sizes, and rolling upon each other, would turn equally, and if the circumferences be divided into 5 and 3 parts respectively, the points of division would come opposite to each other as the wheels turned. The circumferences of these circles are called the *pitch-lines*, and the portions of them included between two teeth is called the *distance of the teeth*; the distance, or arc CD, on the one wheel must be equal to the distance CE on the other wheel, in order that the motion may bring the two points D and E together. For a reason that will appear in the sequel, we cannot use wheels with so few as 3 or 5 teeth, and therefore we subdivide the distances CD and CE into some number of parts, say 4, and thus obtain wheels of 20 and 12 teeth instead. Since the tooth of the one wheel must necessarily come between 2 teeth on the other, the distance between the teeth must be halved, the one half being given for tooth, and the other half for space.

Having then divided off the pitch-line of the wheel B, as in fig. 1, CD being the distance of the teeth, CG the half distance, let us sketch any contour, CFGHD, for the shape of a tooth, and let us examine what should be the characters of this outline. In the first place, the form of this outline must be repeated for each tooth; and in the second place, the line should be symmetric from the top, F, of the one, to the top, I, of the next tooth, in order that the wheel may be reversible face for face. These obvious conditions having been attended to, let us cut, in thin sheet brass or other convenient material, a disk having this outline, and let us pin its center at the point B. Having prepared a blank disk on which the outline of A is to be traced, let us slip it under the edge of the previous one, and pin its center at the point A. If, now, B and A being held fast, we trace the outline of B upon A, we move each of them slightly but in the proper proportion forward, and make a new trace upon A, and so continue as far as needed, we shall obtain a multitude of curve lines marked upon A. The line which envelops and touches all these curves is, obviously, the proper outline for the wheel A; and thus it appears, that whatever outline, within reasonable limits, may have been assumed for the teeth of B, it is always possible by a geometrical operation, to discover the

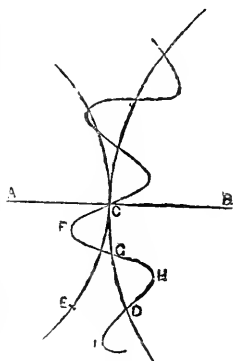


FIG. 1.

proper corresponding form for the teeth of A. These forms may be called *conjugate* to each other, inasmuch as, that if the disk A were now cut out and used as B has been, the identic form of B would be reproduced.

We may obtain a whole series of wheels, A', A'', A''' , etc., from the same original B; and from A as an original, we may obtain another series, B', B'', B''' , etc., having various numbers of teeth. And it has been shown that any wheel of the series A will work accurately along with any one of the series B. So far well; but then the wheel A of 20 teeth may not be like the wheel B of the same number of teeth. It becomes, therefore, a desideratum to choose the form of the teeth of B in such a manner that its conjugate of the same number of teeth may have the same form; by such an arrangement, we shall obtain a series of wheels, any one of which will work with any other.

If the number of the teeth of B be augmented indefinitely, the outline of the pitch-line will become nearly straight; and so drawing through C (fig. 2) a straight line to touch the pitch-line of A, we shall have the pitch-line of the straight rack, as it is called, which could be worked by any wheel of the series A. The reverse of this rack would work with any one of the series B, and therefore, if the series A and B be identic with each other, the rack must be its own reverse. Thus we obtain a very important general result—viz., that if we mark off along a straight line distances, CD equal to the desired interval between the teeth, and then draw any line CKLMD, consisting of 4 equal parts, CK, KL, LM, MD, symmetrically arranged, all the wheels obtained from this as the original, will work into each other; and moreover the forms thus obtained answer for internal as well as external teeth.

FIG. 2.

Being then at liberty to choose any line whatever, subject to the above condition of symmetry, for the figure of the straight rack, we may inquire whether it may not be arranged so as to bring about other desiderata. This line, it may be noted, is not necessarily curved; it may be composed of straight lines, or partly of straight and partly of curved lines.

The general appearance of this wavy line recalls that curve known as the curve of sines, which, indeed, is the simplest known curve, consisting of equal and symmetric undulations, and unlimited in extent. By changing the ordinates in any ratio, say in the ratio of PQ to PR, the waves of the curve may be made shallower or deeper; and on studying the effects of such a change, we discover some new and very important laws concerning the contacts of the teeth of wheels.

Beginning with the curve of sines *proper*, in which the greatest ordinate, SK, is equal to the radius of a circle of which CD is the length of the circumference, it is found that wheels traced from it can only touch each other at *one* point; of course such wheels cannot work; because the solitary contact is now on the back and now on the front of the tooth. In this case the contour of the tooth crosses the pitch line at an angle of 45° . On deepening the teeth, still keeping to the same kind of curve, it is found that the wheels begin to touch at more points than one; and when they are made so deep as that the contour crosses the pitch-line at an angle of 65° , there are always three contacts, neither more nor less. If the teeth be still further deepened, the contacts become more numerous; they appear and disappear in pairs, so that with an inclination of, say, 68° , there would be sometimes three, and sometimes five contacts. When it becomes $70^\circ 17'$, there are always five; and with an inclination or $73^\circ 11'$, there are always seven points in contact at once.

Of these points of contact, some are on the sides of the teeth, and others are near the top and bottom; the latter, on account of the obliquity of their action, are of no use in driving; they may be called supplementary, and their number is always one less than the number of useful or working contacts. In the system of seven contacts, four are useful, two of them being forward, and two backward, so that two teeth are always in action at once; an arrangement by which a gradual improvement in the equality of the teeth is secured by their wearing.

When two properly formed wheels are put in motion, the points of contact move also, and describe a peculiarly shaped line, the nature of which depends on the character of the primary form adopted for the tooth of the straight rack. Conversely, if this path of the points of contact be first assumed, and the law of motion in it be observed, the form of the tooth of any wheel may thence be obtained; and this leads us to the most convenient way of making the delineation.

In fig. 3, the form of the straight rack and the corresponding shape of the teeth of a wheel of 20 are shown in contact, the depth of the tooth being such as to give five contacts, which in the drawing are at the five points marked 0. If we suppose the rack to be slid upward, carrying the wheel along with it, the points of contact will change; and when the motion has been one-eighth part of the interval between two teeth, these points will occupy the positions marked 1. When a motion of another eighth is made, the two upper contacts on the left hand merge into one, and are about to disappear; at the same instant, two new contacts begin at the lower point, marked 2; and thus the motion

continues in the order of the numbers marked along the peculiarly shaped path of the points of contact. Those contacts which occur along the crossing lines of the curve are working contacts; those which happen along the two external arcs, are supplementary. When the form of this path, and the positions of the successive points in it have been obtained by calculation, the outline of any wheel is easily traced geometrically.

In well-constructed machinery there should never be fewer than seven contacts in the system, since of these only four are working; and therefore only two teeth are fully engaged; and it is necessary that two teeth be engaged at once, in order that the wearing may tend to remove any unavoidable inequalities of workmanship.

When we attempt to delineate the forms of wheels with few teeth by help of any of these orbits, we find that the contours overlap each other; in such cases the following tooth of the conjugate wheel effaces, as it were, the trace belonging to the preceding tooth; and the contacts, though still holding good of the geometrical curves, become mechanically impossible. Thus it is that there are limits below which we cannot go in the numbers of the teeth. If the overlapping occur at the shoulder of the tooth some of the useful contacts are wanting; but when the replication is only at the point of the tooth, the want of the supplementary contact, occasions no inconvenience. An examination of the different cases shows that, with seven contacts, the smallest numbers which can be used on the three systems just mentioned are 19, 17, and 11, so that the system of epicycloidal teeth has, in this respect, the advantage over the others. Clock pinions, then, should not have fewer than eleven leaves. This method of considering the subject was first published by the writer of this article in *A New General Theory of the Teeth of Wheels* (Edinburgh, 1852).

It remains to cut the actual wheels to the shapes thus formed. The essentials of the operation are these: The blank wheel is attached to the axis of a large divided circle, which can be turned round and held in any desired position. A cutter, generally a revolving cutter, is brought down upon the blank, so as to notch out the space between two teeth; this done, the circle is turned round by the proper number of divisions, and another space is cut, and in this way the whole circumference of the wheel is gone over. In order that the work be well done, it is essential that the cutter be truly shaped; and when the edges get blunted by use, it is no easy matter to avoid spoiling the shape in the resharpening. Whatever system be followed, the form of the tooth varies from one number to another, so that the cutter which answers for a wheel of 20 cannot do for one of 30 teeth; and hence, when accurate results are wanted, there must be a cutter for each wheel. In order to avoid the expense of so many cutters, each requiring to be carefully made, the slovenly practice is too often followed of having, perhaps, two cutters, one to be used for pinions, the other for wheels; and the result is the intolerable noise which is so common in mills, and which, if properly understood, should be taken as an indication of unnecessary expenditure of power.

When, as in the wholesale manufacture of clocks and watches, multitudes of wheels are to be cut of one size, careful attention can be given to the shape of the cutter. The labor is economized by binding a considerable number of blanks together on the dividing engine, and plowing out the teeth of the whole of them at once. For the small wheels, technically called pinions, which cannot conveniently be fixed on the dividing-engine, *pinion-wires* are used; these are wires of brass or steel drawn through holes of the proper shape, and having the leaves running all along them. The watchmaker removes the leaves from those parts where they are not wanted, and thus obtains the pinion and its axle in one piece; in this way he gains the advantages of solidity and economy of workmanship.

Among the many purposes to which wheel-work is applied, it sometimes happens that an unequable motion is wanted. Thus, in the construction of an orrery, it is desirable that while one index turns uniformly to show the time, another may turn so as to show the unequal motion of the sun in the ecliptic. In that case the variations of the velocity are small, and it is enough to divide the teeth unequally, as the slight inequality can hardly affect the working of the apparatus. But when the changes of velocity are considerable, the matter must be more carefully looked into. If we suppose the pitch-lines of two wheels to be uneven, and to roll upon each other without regard to the positions of their centers, the forms of teeth to be arranged upon those pitch-lines may be traced out almost in the manner already explained for round wheels. The pitch-line must be divided into equal distances, and the disk must receive a half-sliding, half-

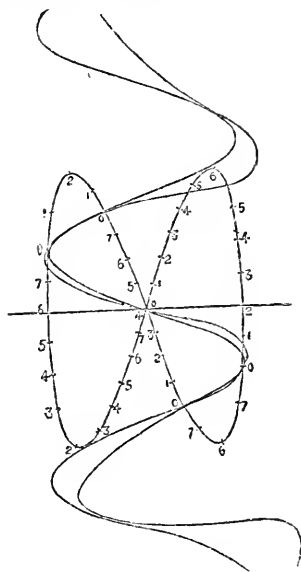


FIG. 3.

turning motion, so that the pitch-line may pass through the point C (fig. 4) always perpendicularly to the line AB, which is the line of centers for round wheels. The combination of this motion with the proper motion of the points of contact gives true forms for the teeth.

Thus, the form of the tooth can be obtained when that of the pitch-line is known. Now, when two disks, turning on fixed centers, touch each other at any point out of the straight line joining these centers, there is a slipping of the one surface over the other; and therefore, in order that the pitch-lines may roll together, they must be so shaped as that the point of contact may be in the line of centers. It can be shown that, for any assumed contour of the wheel A, another contour having its center at B, and rolling upon A, is possible. But, except in one or two special cases, the working out of the problem has not been accomplished. It will be enough here to mention the single case of elliptic wheels. The action of these is founded on the well-known property of the ellipse, that the sum of the distances of any point in it from the two foci is constant, and that the curve makes equal angles with these two lines. Hence two equal ellipses turning on their foci, when their centers are at a distance equal to the major

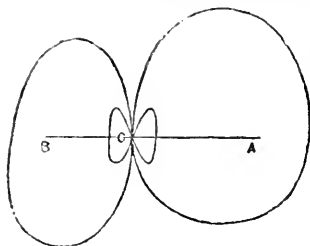


FIG. 4.

axis of the ellipse, will roll upon each other; and teeth formed upon these as pitch-lines will work perfectly. When the ellipses have their major and minor axes in the proportion of 5 to 4, the focus is at one-fifth part of the major axis from one end; and therefore one focus, at one part of the revolution, moves four times as fast—at another part, four times as slowly—as the other focus.

Sometimes one of the wheels has to be quite at rest during part of the motion of the other wheel. This is accomplished by causing some part of the wheel that is to be stationary, to bear upon a part of the circumference of the moving-wheel which is concentric with its axis. This is exemplified in the arrangement for counting wheels shown in fig. 5. The object of this apparatus is to count and record the revolutions of the wheel B. As this wheel turns round, a pin E attached to it enters into the slit GH, and thus carries the wheel A round as long as the pin remains in the slit, that is, until the slit GH be brought into the position IK. As soon as E leaves the slit at I, there would be no further connection between the two wheels, and A could be moved anyhow, altogether independently of B. In order to prevent this, the disk B is made nearly five-sixths entire, and parts of A are scooped out between the slits so as to receive and to fit B. By this means A is prevented from being turned either backward or forward until the pin E again comes into one of the slits. When this happens, the projecting part at G finds room in the recess F. If there be seven slits, GH, round the wheel A, and if B turn once in twenty-four hours, an index attached to A would show the days of the week; and the index might be made to be stationary all day, the change being effected during the night. Another example of this kind of interrupted motion is seen in the ordinary dead-beat clock escapement, in which the detaining surface of the pallet is concentric with the axis of the crutch.

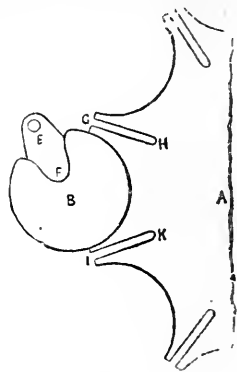


FIG. 5.

When the axes are inclined to each other, beveled wheels are used. Just as common wheels may be regarded as fluted cylinders, beveled wheels may be described as fluted cones having a common apex. The principles which regulate the formation of the teeth of these are the same as for plane wheels, but the application of these principles is considerably more intricate. Since both the teeth and the spaces between them are tapered, it is impossible to notch out the intervals by means of a revolving cutter. Attempts have been made to construct machinery for forming the teeth by means of a cutter moving in a line toward the apex of the cone, but the complexity of the apparatus, and the slowness of the process, have prevented its introduction; and thus the accurate formation of beveled wheels has still to be accomplished by hand.

WHEELER, NATHANIEL, b. Watertown, Conn., 1820; received an ordinary education, and engaged in manufacturing. In 1850 Allen B. Wilson brought to his notice certain inventions and improvements in the manufacture of sewing-machines. Mr. Wheeler and others furnished the necessary capital, and in 1852 a patent was obtained, and the "Wheeler and Wilson Manufacturing company" was founded. The immense works of this establishment are now at Bridgeport, Conn. See SEWING-MACHINES.

WHEELER, WILLIAM ADOLPHUS, b. Malone, N. Y., 1819; entered the university of Vermont, but did not graduate. He then studied law, was admitted to the bar, and was for some time district attorney of Franklin co., N. Y., which he represented in the

assembly in 1850-51. He served in the New York senate in 1858-59, was president of the New York constitutional convention, 1867-68, a member of the 37th, 41st, 42d, 43d, and 44th congresses; and during the 43d chairman of the special committee which went to Louisiana and brought about the "Wheeler compromise." He was vice-president of the United States, 1877-81. He has shown high legal attainments and a balanced judgment.

WHEELER, WILLIAM ADOLPHUS, 1833-75; b. Mass.; graduated at Bowdoin college, 1853, and for some years taught school. In 1859 he became the assistant of Worcester in the compilation of his dictionary, and afterward did important work in the revision of Webster's dictionary and in editing Hole's *Biographical Dictionary* and the *Dickens Dictionary*. From 1867 until the time of his death he was assistant librarian of the Boston public library.

WHEELERA, a genus of trees of the natural order *leguminosæ*, sub-order *papilionaceæ*. The word of *W. ebenus*, a native of the West Indies, and of the tropical parts of America, is imported into Britain under the name of *American ebony*. It is very hard, of a brownish-green color, takes a fine polish, and is employed by cabinetmakers and musical-instrument makers.

WHEELING, a city and port of entry of West Virginia, U. S., on the left bank of the Ohio river and both sides of Wheeling creek, 40 m. direct, and 92 by river, below Pittsburgh. The city is built at the foot of the hills which rise to the Alleghenies, and is the terminus of the Baltimore and Ohio, and of the river division of the Cleveland and Pittsburgh railways. The great national road here crosses the Ohio, over which is a wire suspension-bridge, 1010 ft. long. The hills around the city are full of bituminous coal, which sells for 1d. a bushel. In 1864 there were 49 steamboats, numerous foundries, and other metallurgic works, glass-houses, paper-mills, flour-mills, breweries, tanneries, etc.; and 2 daily newspapers. Pop. '70, 19,280.

WHEELING (*ante*), the capital of West Virginia, and co. seat of Ohio co.; pop. '80, 31,266. The city, which has a length of 5 m. along the river, has a custom-house, which is also used as a United States court-house, and post-office, a state-house, an opera-house, and odd-fellows hall, etc. There are banks, a public library, a college for women and 9 newspapers. It has an extensive trade, and contains many large manufacturing establishments. It was settled in 1774, incorporated in 1806, and has been the capital of the state since the separation of West Virginia from Virginia, except in the years 1870-75.

WHEELLOCK, ELEAZAR, D.D., 1711-79; b. Conn.; graduated Yale college, 1732; ordained pastor of the Congregational church, Lebanon, Conn., 1735; established a school at Lebanon for the education of Indian youth, from which afterward grew Dartmouth college. He removed to Hanover, N. H., 1770, and was the president of the new college for 9 years. He published a *Narrative of the Indian School*.

WHEELLOCK, JOHN, D.D., LL.D., 1754-1817; b. Conn.; studied 3 years at Yale college; went with his father to Hanover, 1770, and graduated at Dartmouth college, 1771; was tutor, 1772-74; represented Hanover in the legislature, 1775; served for a time in the continental army; became lieutenant-col. and maj.; was on Gates's staff; elected president of the college on the death of his father, 1779; visited England, 1783, to obtain funds; was shipwrecked off Cape Cod and lost his money and papers; was removed, 1815, on account of an ecclesiastical controversy, but restored in 2 years. He published *Sketches of Dartmouth College*.

WHEELWRIGHT, JOHN, 1594-1679; b. England; graduated Cambridge, 1614; vicar of Bilsby, 1623-31; suspended by Laud for nonconformity; came to America, 1636; pastor at Braintree, Mass. His adoption of the religious views of his relative, Ann Hutchinson, alienated Mr. Wilson pastor of the Boston church; this and a sermon considered seditious caused his banishment from the colony by the general court, 1638. He went to New Hampshire, founded the town of Exeter; organized a church; removed with a part of the church to Wells, Me.; returned to Massachusetts, 1646; was minister at Hampton, 1646-54; went to England and was well received by Oliver Cromwell, who had been his classmate; returned, 1660; pastor of Salisbury, N. H. He published a reply to Thomas Welde's *Mercurius Americanus*.

WHEELWRIGHT, WILLIAM; 1798-1873; b. Mass.; became a sailor, and engaged in trading on the coast of South America. In 1835 he undertook to establish a line of steamers on the w. coast, and the result was the great Pacific Mail steamship company. From 1842 until the time of his death he was engaged in the construction of South American railroads, the most important being that from Caldera across the Andes to Rosario on the Parana, 934 m., opened in 1872. Wheelwright was the first to introduce the telegraph system and lighting by gas into South America.

WHELEK, *Buccinum* a genus of gasteropodous mollusks, of the family *buccinidae*. The shell is ovate, turreted, and more or less ventricose; its mouth ovate, emarginate, or produced into a very short canal below, the outer lip expanded, the inner lip usually thin and smooth within. The operculum is horny. The animal has a broad head, with two tentacula, with the base of which the stalks bearing the eyes are united, the proboscis is large, and the tongue armed with teeth, which are used for the purpose of

rasping substances used for food—almost any animal substance being welcome for this use—or for perforating the shells of other mollusks in order to prey upon them. There are about 20 known species, chiefly found on the coasts of the colder parts of the world. The British coasts produce several species, of which the most abundant is the COMMON WHELK (*B. undatana*). It occurs from low-water mark to a depth of 100 fathoms, is some times 3 in. in length, grayish or brownish white, with numerous raised ridges and spiral striae. It is very widely distributed in the northern parts of the northern hemisphere, and is one of the most common mollusks of the arctic regions. It is much used as an article of food, is cooked simply by boiling, and is generally eaten with vinegar and pepper. Great quantities are consumed in London, chiefly by the poorer classes. In former times, whelks would appear to have been more highly esteemed than now. Eight thousand of them were provided for the enthronization feast of William Warham, archbishop of Canterbury, in 1504. Yet on some parts of the British coasts, as on those of Scotland, whelks are never eaten, a prejudice existing against them as unsuitable for food. The whelks brought to the London market are mostly obtained by dredging. On the coast of Galloway, where they are used as a bait for catching cod, they are procured by letting down baskets containing pieces of fish in about 10 fathoms of water. The baskets being taken up next day, are found to contain many whelks which have crept into them to feed on the garbage. The name whelk (or *welk*) is popularly given in Scotland to the periwinkle, the whelk being known by that of *backie*.—There are more than 100 fossil species of whelk in the miocene formations.

WHELK, or **BUBBLE**. These are terms used by the older English writers, and by Dr. Craigie in recent times, to signify the cutaneous disorder now commonly known as *acne*. The simple whelk, the black whelk, the inveterate whelk, and the crimson whelk, correspond to *acne simplex*, *acne punctata*, *acne indurata*, and *acne rosacea* of the more modern dermatologists. The symptoms of the crimson whelk, or fiery-face, must have been carefully observed by our great dramatist before he could have written Fluellen's graphic description of Bardolph: "His face is all bubukles, and whelks, and knobs, and flames of fire, but his lips plows at his nose; and it is like a coal of fire, sometimes blue, and sometimes red."—*King Henry V.*, act iii. sc. vi. The *chinwhelk* is the old name for the affection now known as *syccosis* or *mentagra*.

WHEWELL, WILLIAM, D.D., was b. in 1795 at Lancaster. His father intended him for his own trade—that of a joiner; but the boy having excelled at school in mathematics was persuaded to go to Cambridge. He entered at Trinity college, and graduated (second wrangler, and second Smith's prize-man) B.A. in 1816. He became a fellow, and afterward a tutor of Trinity, where also, for many years, he acted as a successful "coach," or private tutor. In 1820 he became a fellow of the royal society. Between 1828 and 1832 he was professor of mineralogy in Cambridge; and between 1833 and 1855, professor of moral theology, or casuistry. In 1841 he was appointed master of Trinity; and in the same year, he was president of the British association at its meeting at Plymouth. He was also, for a time, president of the geological society. In 1855 he became vice-chancellor of the university of Cambridge. He died at Trinity (1866), in consequence of injuries sustained through a fall when riding.

Whewell, when he acted as a private tutor, produced several text-books on mathematical subjects (one of which, his *Dynamics* [1823], is deservedly admired), which were for a time popular, but may now be said to have been superseded. He also contributed a variety of papers to the transactions of learned and scientific societies, and to scientific journals, and to the reviews. In some of these, he treated of such subjects as the tides, electricity, magnetism, and heat; in others, of abstruse and recondite subjects, literary, historical, and metaphysical. Later in life, while he continued to write papers of this class, he concentrated his powers mainly on the production of large works. Among the most important of his books are—*Astronomy and General Physics considered in Reference to Natural Theology*, being the third Bridgewater treatise (Lond., 1833); *History of the Inductive Sciences, from the Earliest to the Present Times* (3 vols., Lond., 1837); *The Philosophy of the Inductive Sciences, founded upon their History* (2 vols., Lond., 1840); *The Elements of Morality, including Polity* (Lond., 1855). Among his other works are—*The Plurality of Worlds*, which had considerable popularity from its subject; *The History of Scientific Ideas, Novum Organum Renovatum*; *Notes on the Architecture of German Churches*; *Lectures on the History of Moral Philosophy in England*; *Indications of the Creator*; translation of Goethe's *Herman and Dorothea*; translation of Auerbach's *Professor's Wife*; translation of Grotius's *Rights of Peace and War*; a translation of Plato's works; and *The Platonic Dialogues for English Readers*. Besides these books, he published many essays, as yet uncollected. His last composition, so far as is known, is an attack on Comte and Positivism, which appeared in *Macmillan's Magazine* after his death.

Whewell's acquisitions were most various; it would have been sufficient occupation for the lives of most book-worms to have made them. His writings, again, were so various and voluminous, it might be thought sufficient employment of the life of a mere clever book-maker to have produced them. Whewell was neither book-worm nor book-maker. A clear-headed student, he was always increasing his stock of knowledge; a vigorous and independent thinker and writer, he was always giving forth the results of his studies to the public; and having thus proceeded during a long life of almost unin-

interrupted good health, he may be taken as illustrating what at the best may be achieved by a man of ambition, ability, and unlagging industry, without genius. He was nowise superficial, like many pretenders to encyclopedic knowledge; he was really master of all that could be learned on a great many subjects. It has been said of him, "knowledge was his forte, omniscience his foible;" but it is absurd to suggest that a man can have and strain after too much knowledge, if it be, as his was, thorough knowledge. His chief ambition was to grasp, survey, and co-ordinate the sciences; and he did excellent service both to science and history in the effort to gratify it. The task suited one of his extraordinary acquisitions, good sense, and philosophic comprehension. Had he been a man of more imagination and ingenuity, he might, of course, have been better employed in endeavoring to advance some single science. As he was, this was beyond him: he made some original investigations; but the results must be pronounced unimportant.

Whewell was a large, strong, erect man, with a red face and a loud voice. He was an effective preacher and lecturer, though in both characters wanting in that "something" which wins and rivets the hearer. He was accused of being arrogant; and his general bearing gave color to the charge. A story, long current, may be told as illustrating at once his varied knowledge and his personal relations to his brother fellows. He used so to overwhelm with his learning the company at the fellows' table and in the combination room, that a conspiracy was formed to put him down. Some fellows got up a knowledge of Chinese music from scattered articles in old reviews, with which they presumed he would be unacquainted. They then made Chinese music the subject of, as it were, a casual conversation at table. "For a time, contrary to his usual habit, he took no part in the conversation. When they had about exhausted themselves, however, he remarked: "I was imperfectly, and to some extent incorrectly, informed regarding Chinese music when I wrote the articles from which you have drawn your information." They were caught in their own trap, and had, as on other occasions, to submit to be instructed.

WHEY. When any substance, possessing the property of coagulating casein, is added to milk, the coagulated casein separates in flakes and clots, and sinks to the bottom, constituting what is termed the *curds*; while the supernatant, straw-colored fluid is known as the *whey*. Cheese-making affords the principal source of whey, which, thus obtained, forms, like butter-milk, a very valuable kind of drink. The whey of goat's milk is regarded as specially beneficial, and in Switzerland and elsewhere, large establishments have been set up for carrying out the *whey-cure*, either alone or in association with the grape-cure. There can be no doubt that, were the cases judiciously selected, much good, in the way of eliminating morbid matter, might be effected in a few weeks by confining the patients to a diet of brown bread, grapes, and whey; while, on the other hand, many diseases might be much aggravated by that treatment. In ordinary medicine, we recognize several useful varieties of whey, as: White-wine whey, prepared by the addition of sufficient sherry to a tumbler of heated milk to coagulate the casein. On decanting off the whey from the curds, and sweetening, we obtain a favorite sudorific draught, which may be taken with advantage as a sudorific at bedtime, whenever there is a threatening of incipient cold in the head. *Cream of tartar whey* and *niter whey*—the former prepared by boiling 100 grains of cream of tartar in a pint of milk, and the latter by the similar use of niter—act in the same way as wine whey, but more powerfully. *Tamarind whey* has been already described in the article on that fruit.

WHIG, the name given to the adherents of the colonial cause during the controversy between Great Britain and her American colonies, and during the revolutionary war. The adherents of the crown were called *tories* or *loyalists*. The term *whig* lost its political signification in this country till 1832, when it was revived, and assumed by the opponents of Jackson, who then dropped the name of national republicans, by which they had been known and took that of whigs, imitating the English whigs, whose opposition to the power of the throne they compared to their own opposition to Jackson's extensive use of the veto-power. For its history, see UNITED STATES.

WHIG AND TORY, the names which for the last two centuries have been popularly applied to two opposite political parties in Great Britain. Both were at first names of reproach. *Whig* was originally a nickname of the peasantry of the western lowlands of Scotland, said by some to be derived from a word or sound used by them in driving their horses; by others, from *whig*, "an acetous liquor subsiding from sour cream."—*Jamieson*. Its next application was to the bands of Covenanters, chiefly from the west of Scotland, who, subsequently to the murder of archbishop Sharpe, took up arms against the government, and after gaining some successes in encounters with the king's troops, were defeated at Bothwell bridge. Thence the name *whig* (or *whigamore*) came to be fastened, first on the whole Presbyterian zealots of Scotland, and afterward on those English politicians who showed a disposition to oppose the court, and treat Protestant nonconformists with leniency. The word *tory*—said to be derived from *tora, tora*, in Irish, "give, give," or "stand and deliver"—was first given to certain bands of outlaws, half-robber, half-insurgent, professing the Roman Catholic faith, who harassed the English in Ireland; and was thence applied reproachfully to all who were supposed to be abettors of the imaginary popish plot; and then generally to persons who refused

to concur in the exclusion of a Roman Catholic prince from the throne. These two nick names, which came into use about 1680, immediately became familiar words, and have since been retained as designations of two opposite political sides—the Tories being, generally speaking, the adherents of the ancient constitution of England without change, and the supporters of regal, ecclesiastical, and aristocratic authority; while the Whigs have been the advocates of such changes in the constitution as tend in the direction of democracy. The most sweeping constitutional change of the present century which the Whigs have carried is the reform bill of 1832. Each party, while preserving within certain limits a general consistency of purpose, has undergone many changes in its principles, professions, and modes of action with the altering circumstances of the country; and among persons who have been considered adherents of each side at any given time, there have seldom been wanting a variety of more or less distinctive shades of opinion. A division in the ranks of either party has often led the more moderate section of that party to coalesce with the opposite side; and at other times, the extreme party of innovation, dropping their connection with the Whigs, have adopted another name, as when those politicians whose desire was to have the whole institutions of the country remodeled on a democratic basis, assumed the designation of *radical reformers* or *radicals*. See also CHARTISM. For a considerable time after the reform bill, the governing section of the Whig party were more disposed to maintain the principles of the changes already made, than to insist on further constitutional changes; and the principles maintained by Whigs and Tories sometimes approximated so closely that the difference seemed more one of men than of measures. Sometimes one party, sometimes the other, has appeared as the advocate of measures which have proved beneficial. In the agitation for the repeal of the corn-laws, which lasted from 1841 to 1846, the Tories were ranked on the side of protection, and the Whigs of free trade; but the relations of the two parties had been the reverse at a former period, when Mr. Pitt's advocacy of free trade between England and Ireland was opposed by the manufacturers of Lancashire, who succeeded in getting his measure postponed. During the last thirty years, the names *liberal* and *conservative* have to a great extent superseded the former party designations of Whig and Tory.

WHIMBREL, *Numenius phaeopus*, a bird of the same genus with the curlew (q.v.), and much resembling it in form, plumage, and habits, but of smaller size, and with a bill considerably shorter in proportion. The female, which is larger than the male, is about eighteen inches in length, the bill being about three inches and a half. The plumage of the whimbrel is of a bright ash color, with streaks of brown on the neck and breast. The whimbrel is a very widely distributed bird, being found from the north of Africa and of India to the arctic regions of Europe and Asia. It occurs also in Japan. It is a bird of passage, and visits Britain chiefly in the course of its spring and autumn migrations. A few whimbrels breed in Shetland; but the number is diminishing, the eggs being in great request as a delicacy. The flesh is also highly esteemed.

WHIN. See FURZE.

WHIN-CHAT, *Saricola rubetra* (see CHAT), a bird very similar to the stone-chat (q.v.), a summer visitant of Britain and of the northern parts of Europe. It is widely diffused over the British islands in summer, but nowhere very abundant. The head, sides of the neck, and upper parts of the body are blackish brown, each feather bordered with rusty yellow; an elongated streak of white above each eye; the throat and a streak on each side of the neck white; the breast, rust-color; a large white spot on each wing; the tail white, except the two middle quills and the tip, which are blackish brown. The colors of the female are less distinct than those of the male. The whin-chat frequents furze (or whin) bushes. Its song is pleasant.

WHINSTONE (probably from the same root as *whine*, and meaning the sounding, ringing stone), a name popularly given in Scotland to any hard and compact kind of stone, as contra-distinguished to sandstone or freestone, and rocks of slaty structure. Thus, in most parts of Scotland, it is the common appellation of basalt, greenstone, and other trap rocks, whilst in some districts it is applied to granite.

WHIPPING. Corporal punishment by whipping, public as well as private, was formerly often awarded by the criminal law of England for minor offenses, such as petty larceny, and was not unfrequently superadded to some other punishment, such as imprisonment or the pillory. In early times, and by the usage of the star-chamber, whipping could not be competently inflicted on a gentleman.—In Scotland sentence of whipping was also frequent, the terms of the sentence sometimes requiring it to be repeated at intervals and in different parts of the kingdom. In the last century the Scottish burgh magistrates were in the habit of awarding sentence of whipping on summary convictions for police offenses, such as broils, street outrages, and the keeping of disorderly houses; but in modern practice the competency of inflicting this sentence at common law without the intervention of a jury has been made matter of doubt. Whipping used not long since to be an occasional addition to the sentence of the judiciary court on persons convicted of aggravated assaults.

The infliction of corporal punishment by whipping on women was prohibited by act 1 Geo. IV. c. 57. In act 5 and 6 Vict. c. 51, directed against attempts to injure or

alarm the queen by discharging fire arms in her majesty's neighborhood, or otherwise, the infliction of public or private whipping not exceeding three times is made part of the punishment. Act 26 and 26 Vict. c. 44 (not applicable to Scotland) authorizes whipping in addition to penal servitude in convictions for robbery, assaults with intent to rob, and attempts to strangle or render insensible with a view of committing a crime, the number of strokes not exceeding 50 in the case of an adult, or 25 in the case of a boy under 16. Recent legislation, both in England and Scotland, has made various provisions for the infliction of this description of corporal punishment on juvenile culprits. Whipping of boys under 16 for various offenses is authorized by the English criminal consolidation act (1861); it being provided that the whipping is to be private, and not repeated more than once, and the instrument of punishment to be specified in the sentence. Similar provisions, with some additional ones, occur in 25 Vict. c. 18, as to the mode in which the same punishment is to be administered on summary convictions by justices. In Scotland, the prisons amendment act, 14 and 15 Vict. c. 27, and the act 23 and 24 Vict. c. 105, which superceded it, authorize the whipping of boys under regulations made by the lord advocate and approved by the secretary of state. By act 25 Vict. c. 18, no person above the age of 16 can now be whipped in Scotland for theft, or any crime against person or property. It is a very general impression among magistrates that whipping to the moderate extent allowed by 26 and 27 Vict. has had a most salutary effect in repressing certain kinds of outrage, the apprehension of mere imprisonment, or even of penal servitude, having little efficacy in the way of prevention. Thus, personal chastisement, the oldest form of punishment for crime, has to a certain extent been resumed in the administration of the criminal law.

As regards corporal punishment in the army and navy, see FLOGGING.

WHIPPLE, ABRAHAM, 1733-1819; b. Providence, R. I.; capt. of a privateer during the French and Indian wars. In 1772 he was commander of the expedition from Providence which burned the British schooner *Gaspee* in Narragansett bay, and 3 years later, with 2 armed vessels and 2 row galleys, he captured one of the tenders to the British frigate *Rose*. He commanded the schooner *Providence*, which did great damage to British shipping; and on her capture took command of the frigate *Providence*. In 1779 he fell in with a fleet of nearly 150 sail, under the protection of a 74-gun ship and some smaller vessels. Putting his guns out of sight, he ran up the British flag, joined the merchantmen, captured one every night, and sent her home with a crew taken from his own. He thus captured 10 vessels, 8 of which reached America in safety. In 1780 he lost his vessels, and was captured, while trying to rescue Charleston with a squadron; and he remained a prisoner till the close of the war.

WHIPPLE, AMIEL W., 1817-63; b. Mass.; graduated at West Point in 1841, and was appointed to the engineers. He was assistant astronomer to the commission on the n.e. boundary between the United States and Canada, 1844-49, and to the commission to determine the Mexican boundary, 1849-53. He was afterward engaged in surveys for a Pacific railroad, as a light-house engineer, and in other topographical work. In the war of the rebellion he was chief engineer on McDowell's staff till 1862, when he was made brig. gen. and put in command of a brigade to protect Washington. He was in command of a division of the 3d corps of the army of the Potomac at Fredericksburg and Chancellorsville, and was mortally wounded at the latter battle.

WHIPPLE, EDWIN PERCY, b. Mass., 1819; clerk in banking houses at Salem and Boston, and afterward, till 1860, superintendent of the reading-room in the merchants' exchange in the latter city. He has delivered poems and orations before various societies, and has been a frequent contributor to the *North American Review*, the *Atlantic Monthly*, the *Christian Examiner*, and other periodicals. Among his works are, *Literature and Life*; *Essays and Reviews*; *Character and Characteristic Men*; and *Success and its Conditions*.

WHIPPLE, HENRY BENJAMIN, D.D., b. N. Y., 1822; was a merchant; studied theology with the rev. Dr. Wilson; ordained deacon in the Protestant Episcopal church at Geneva by bishop Delancey; minister of Zion church, Rome, N. Y., 1849; ordained priest at Sackett's Harbor, 1850; rector of the church of the Holy Communion, Chicago, 1857; elected and consecrated bishop of Minnesota, 1859. He has been a warm friend and defender of the Indians, among whom he has established missions, which have been probably the most successful of such efforts. He advocates free churches, and nearly all churches in his diocese are free. He is held in very high regard as a sagacious, efficient, and devoted Christian laborer.

WHIPPLE, WILLIAM, 1730-85; b. Me.; became a sailor and engaged in the West India trade, in which he gained a fortune. He was a member of the provincial congress and committee of safety of 1775, and of the continental congress of 1776, being one of the signers of the declaration of independence. He led the New Hampshire troops at the battle of Saratoga; in 1778 was again in congress; and at the close of the war became a judge of the state superior court.

WHIP-POOR-WILL, *Caprimulgus* or *Antrostomus vociferus*, a species of goatsucker (q. v.), a native of North America, common in the eastern parts of the United States. It receives its popular name from the fancied resemblance of its notes to the words *Whip*

poor Will. It is about ten inches long, the plumage very like that of the European goat-sucker, much mottled and indistinctly marked with small transverse bands, the top of the head streaked with black, a narrow white collar on the throat. The bristles at the base of the bill are very stiff, and more than an inch long. This bird is seldom seen during the day, but seeks its food by night, catching moths, beetles, and other insects on the wing. Its flight is near the ground, zigzag, and noiseless. Its notes are heard only during the night, and are clear and loud, so that when a few of these birds are close at hand, the noise is such that those unaccustomed to it cannot sleep. In the more southern parts of the United States, the whip-poor-will is replaced by a larger species, the chuck-will's-widow (q.v.), and on the upper Missouri and to the west by a smaller one (*U. or A. Nuttallii*).

WHIRLPOOL, a circular current in a river or sea, produced by opposing tides, winds, or currents. It is a phenomenon of rare occurrence on a large scale, but illustrations in miniature may be noticed in the eddies formed in a river by means of obstacles or deflections. The two celebrated sea whirlpools, Charybdis (see *SCYLLA*) and Malström (q.v.), are now known to be merely "chopping seas," caused by the wind acting obliquely on a rapid current setting steadily in one direction while the tide is flowing, and in the opposite direction when it is ebbing. During calm weather, neither of these so-called whirlpools is dangerous for large ships, but when the current and the wind are strongly in opposition, the broken swell is so violent and extensive in the Malström as to founder large ships, or drive them against the rocks. Though in neither of these two cases, formerly so much dreaded, is there any vortical action, instances of such action do actually occur in various localities, as in the whirlpool of Corrievreckin (q.v.), and in some eddies produced by opposing winds and currents among the Orkney Islands.

WHIRLWINDS AND WATERSPOUTS. Whirlwinds differ in many respects from the storms described in the articles *STORMS* and *TYPHOONS*. They seldom continue longer than a minute at any place, and sometimes only a few seconds; their breadth varies from a few yards to nearly a quarter of a mile; during their short continuance, the changes of the wind are sudden and violent; and the barometer is not observed to fall. The direction of the eddy of the whirlwinds, especially when the diameter is very small, differs from the rotation of winds in a storm, in that it may take place either way—right to left, or left to right—according to the direction of the stronger of the two winds which give rise to the whirlwind. Thus, suppose it to arise from a n. wind blowing side by side with a s. wind, and to the w. of it, then, if the n. wind be stronger, the whirl will be n. w., s., and e.; but it will be in a contrary direction if the s. wind be the stronger. Whirlwinds often originate within the tropics during the hot season, especially in flat sandy deserts; these becoming unequally heated by the sun, give rise to ascending columns of heated air. In their contact with each other, the ascending currents result in eddies, which draw up with them large clouds of dust, and the whole is borne forward by the wind that may happen to be blowing at the time. This is the origin of the *dust whirlwinds* of India, which have been admirably described and illustrated by P. F. H. Baddeley. These dust-storms are frequent in dry warm regions; and in the case of the *sinoom* (q.v.), which may be regarded as a succession of such whirlwinds, they appear on a scale of the most appalling grandeur.

Extensive fires, such as the burning of the prairie in America, and volcanic eruptions, also cause whirlwinds, by the conflicting currents of heated air they occasion; and these, as well as the whirlwinds already mentioned, are generally accompanied with heavy rains, hail, and electrical displays. Whirlwinds are also of frequent occurrence in France, doing great damage to the vineyards and other crops; but in Great Britain they seldom occur.

Waterspouts are whirlwinds occurring on the sea or on lakes. When fully formed they appear as tall pillars of cloud stretching from the sea to the sky, whirling round their axes, and exhibiting the progressive movement of the whole mass precisely as in the case of the dust-whirlwind. The sea at the base of the whirling vortices is thrown into the most violent commotion, resembling the surface of water in rapid ebullition. It is a popular fallacy that the water of the sea is sucked up in a solid mass by waterspouts, it being only the spray from the broken waves which is carried up. Observations of the rain-gauge conclusively prove this.

What are sometimes called *waterspouts on land* are quite distinct from these phenomena. They are merely heavy falls of rain of a very local character, and may or may not be accompanied with whirling winds. They generally occur during thunderstorms, being quite analogous to severe hail-storms, from which they differ only in point of temperature. Also all the moisture that falls is the result of condensation; whereas, in the true waterspout the rain is mixed with spray which has been caught up from the broken waves, and carried aloft by the ascending currents of the whirlwind.

WHISKY (Gaelic, *uisge*, water; *uisge-beatha*, commonly written *uisge-baugh*, water of life), a spirit made by distillation from grain, roots, and other materials, the best being produced from barley after it has been malted, though what is termed raw grain whisky (made from wheat, oats, rice, rye, Indian corn, buckwheat, millet, etc.), after being kept for two or three years, is scarcely inferior in quality. Whisky is also made from beet-root, potatoes, beans, molasses, sugar, etc. In these cases malt is used to a small

extent. The mode of manufacture is described under DISTILLATION. Whisky was formerly almost exclusively manufactured in Scotland, Ireland, and the United States; but distilleries are now at work largely in England, Prussia, Sweden, France, Holland, and Belgium, the foreign spirit being, however, coarser, and only suited for fortifying wines and for methylated spirit for manufacturing purposes. According to the statistics for 1871 there was distilled in Scotland 13,813,062; in Ireland, 9,302,253; and in England 7,729,720 gallons. In 1878 duty was paid in England on 13,664,573 gallons; in Scotland on 9,211,817; and in Ireland on 8,216,894. The largest quantity is always made in Scotland; but owing to a large quantity of the spirit being removed to England duty free, to be converted by English rectifiers into British gin, duty is paid on it in England. Scotland sends to England, in excess of the quantity returned from that country, about $3\frac{1}{2}$ millions, and Ireland sends upward of a million gallons annually. The surplus not accounted for is either exported or retained in bond. Owing to legislation in 1848 the export of British spirits rose from less than 300,000 gallons very rapidly, though with great fluctuations, till in 1856-57, it reached nearly 6 millions of gallons; but owing to continental competition, our export has fallen below $1\frac{1}{2}$ million gallons annually, and the trade is now almost entirely colonial. Export is encouraged by a drawback in excess of duty of 2d., while 5d. a gallon is added to duty on foreign spirit imported (except rum, on which 2d. is charged). This allowance is to equalize the loss caused by excise restrictions to the native producer. The manufacture of whisky (as well as of other spirits) in the United Kingdom is placed under the surveillance of the excise, and by act of parliament (6 Geo. IV. c. 80) the distiller is subjected to numerous stringent regulations, with a view to prevent the evasion of the very high duties.

Parliament attempted, at the beginning of the 18th c., to check the excessive use of ardent spirits by imposing the enormous duty of 20s. a gallon, and taxing retailers. The trade became unprofitable, and got entirely into the hands of the profligate and criminal classes. Smuggling flourished, the excise officers were violently opposed, and informers hunted down. The act became a dead letter, and was repealed in 1742, and a moderate duty imposed.

In Ireland the repressive system was carried to a still greater extent, a fine being imposed on the *district* in which illicit distillation was detected, and the unfortunate operatives subjected to transportation for seven years. The effect of this was, that of 10,000,000 gallons annually (1820-23) consumed, only about 3,000,000 paid duty; frequent and murderous conflicts took place between the smugglers and the excise-officers and military, and much of the country was almost in a state of rebellion. In Scotland also, illicit distillation flourished afresh at each rise of the duty; lawless violence was resorted to freely, the common people invariably sympathizing with or aiding the smugglers; and in many cases the officers of excise were effectually intimidated. The difficulty of dealing with illicit distillation in Ireland and Scotland led to the adoption, beginning with 1823, of a considerably lower duty in these two countries than in England. The following table exhibits the relative rates of duty on spirits in England, Scotland, and Ireland at different periods during the present century:

	England.		Scotland.*		Ireland.	
	s.	d.	s.	d.	s.	d.
1802.	5	4 $\frac{1}{2}$	3	10 $\frac{1}{2}$	2	10 $\frac{1}{2}$
1803.	8	0			3	7
1804.			5	10		
1811.	10	3	8	0 $\frac{1}{2}$	2	6 $\frac{1}{2}$ †
1815.			9	4 $\frac{1}{2}$	6	1 $\frac{1}{2}$
1817.			6	2	5	7 $\frac{1}{2}$
1819.	11	8 $\frac{1}{2}$				
1823.			2	4 $\frac{1}{2}$	2	4 $\frac{1}{2}$
1826.	7	0	2	10	2	10
1830.	7	6	3	4	3	4 $\frac{1}{2}$
1840.	7	10	3	8	2	8
1853.			4	8	3	4
1855.	8	0	8	0	6	2
1858.	8	0	8	0	8	0

In 1858, the duty on spirits was equalized in the three kingdoms, thus putting a stop to the systematic and (as was found) irrepressible practice of smuggling spirits from Scotland and Ireland into England, which had prevailed for a long time previously. The duty was in 1860 raised to 10s. per imperial gallon, at which rate it still remains. This rate was increased to its present value by Mr. Gladstone with the avowed intention of diminishing the consumption of ardent spirits; and though it does not seem to have produced this effect, neither has it, as was always the case formerly, increased the practice of illicit distillation, owing to the improved moral tone of the population, the more thorough execution of the law, and the great capital embarked in the distilling trade

* The duty differed in the Highlands and Lowlands till 1814, the difference varying from 6d. to 2s. 5d., giving rise to a considerable amount of smuggling.

† For two years—afterward doubled.

‡ Reduced to 2s. 4d. after 1834.

acting as a deterrent against fraudulent distillation on any extensive scale. Illicit distillation is now very much on the decrease, and is almost confined to Ireland. The high price of whisky, besides limiting its consumption, has had a deleterious effect in increasing the temptation to produce a cheaper drink for the poorer classes by introducing noxious materials resembling it in effect and flavor. In years when the vine crop in France is a failure, large quantities of whisky are sent to that country, and returned as French brandy. In the United States the process of manufacture is the same as in this country, and is largely carried on in New York, Pennsylvania, Ohio, Illinois, Indiana, Kentucky, and, in a less degree, in Tennessee, Missouri, and California. A large quantity is also rectified, and reduced to alcohol, and much is exported and in part returned in the form of "French brandy," "Hollands," etc. The "Monongahela" whisky of Pennsylvania, and that from Bourbon county, Kentucky, are considered the best in the United States, and always fetch a high price.

WHIST, a game at cards, believed to be of English origin; probably a development of the game of *trump* (or, more properly, *triumph*), which was played in England at least as early as the time of Henry VIII. Trump (or triumph) is mentioned in a sermon delivered by Latimer on the Sunday before Christmas, 1529. The game of trump is also mentioned by Shakespeare punning on the word triumph (see Douce's *Illustrations*, and *Antony and Cleopatra*, act iv. scene 12). The game of whist is not mentioned by Shakespeare, nor by any writer of the Elizabethan era.

The earliest mention of *whist* (or, more properly, *whisk*) is in the poems of Taylor the water-poet (1621). In the first edition of Cotton's *Complete Gamester* (1674), whist has no place; but it is added in the second edition (1680) as a game "commonly known in England." Cotton says that "the game of whist is so called from the silence that is to be observed in the play;" and this derivation of the word has been generally accepted, and was adopted by Dr. Johnson, to the extent of explaining whist to be a game requiring silence. But if the original name of the game was whisk, Cotton's derivation fails. The derivation from an interjection signifying silence seems to have been taken for granted somewhat hastily.

The game was formerly played nine-up. The change to ten-up seems to have taken place in the first quarter of the 18th century. Whist played ten-up is called *long whist*. About 1785 the experiment of dividing the game into half was tried, and *short whist* was the result. The short game soon came into favor; and in 1864 the supremacy of short whist was acknowledged by nearly all the London and by many country clubs, the clubs adopting as their standard the laws of short whist as framed by committees of the Arlington and Portland.

Edmond Hoyle, the first writer of any celebrity on whist (commonly called the father of the game), was born in 1672—it is said in the neighborhood of Halifax, Yorkshire, but on insufficient grounds. He was educated as a barrister. He first published his *Short Treatise* about 1742. He used to give lessons in whist at a guinea a lesson. His *Short Treatise* ran through many editions (16 or more) during his lifetime; and since his death his works have been reproduced in numberless ways. Hoyle died in Welbeck street, Cavendish square, on Aug. 29, 1769, aged 97.

The game of whist is played by four persons, two being partners against the other two. The partners sit opposite to each other. The partnership is determined by cutting. The two lowest are partners against the two highest, and the lowest has the deal and the choice of seats and cards. In cutting, the ace is reckoned lowest. Each player has a right to shuffle the pack once before each deal, the dealer having the privilege of a final shuffle. The shuffling being concluded, the player to the dealer's right cuts the pack. The dealer, having reunited the packets, is bound to deal the cards one at a time, to the players in rotation, beginning with the player to his left. He turns up the bottom card (called the trump card). The deal being completed, the players sort their cards, and the player to the dealer's left (or leader) plays a card face upward on the table. The other players follow in rotation, being bound to follow suit if they can. When all have played, the trick is complete. It is then gathered and turned over by the winning side. The highest card wins the trick. The ace is highest in playing; and the other cards reckon in the order, king, queen, knave, ten, etc., down to the deuce, or two, which is lowest. If any player cannot follow suit (i.e., has none of the suit led), he may play any card he pleases. If he plays a card of the suit turned up (called trumps), he wins the trick, unless another player also, having none of the suit led, plays a higher trump. The player who wins the trick becomes the leader for the next trick, and so on till the whole hand (consisting of 13 tricks) is played out.

After scoring, the mode of which will be presently described, the player to the last dealer's left deals in his turn; and in subsequent deals, each player deals in turn, the rotation going to the left.

After the hand is played out, the scoring is thus performed: The side who win more than six tricks reckon one for each trick above six; and the side who either separately or conjointly hold more than two of the following cards, ace, king, queen, and knave of trumps (called honors), reckon as follows: If they hold any three honors, they score two (that being the excess of their honors over their opponents); and similarly if they hold four honors, they score four. At short whist, players who are at four, cannot score

honors. The same at long whist with players who are at nine. The side who thus in one hand or in a succession of hands first reach five at short whist, or ten at long, score the game.

A game at short whist is called a single if the adversaries have already scored three or four; a double if they have scored one or two, a treble if they have scored nothing. A game at long whist is a single if the opponents have scored five or more; a double if they have scored less. There is no treble at long whist.

A rubber consists of the best two games out of three. If the same players win two consecutive games, the third is not played. The winners of the rubber win in points the value of the games they have won, and where the rubber has consisted of three games, the value of the loser's game is deducted. And whether two or three games are played, two points are added for the rubber at short whist; one point for the rubber at long. Thus, if at short whist A B (partners) win a single and a double, they win three points on the games, and they add two for the rubber, making five points. Had A B won the same, but C D (their opponents) won a treble, they would have to deduct three points, the value of the opponents' game, and would only win two points. Long whist is now seldom played.

Whist is a mixed game of chance and skill. The chance resides in the holding honors, and the fortune of having high cards dealt in the hand. The skill consists in the application of such knowledge as shall, in the long run, turn the chances of the cards in the player's favor. At the commencement of the hand, the first lead presents a problem of almost pure chance; but as the hand proceeds, observation of the fall of the cards, inference therefrom, memory and judgment, come in, so that toward the end of the hand we are often presented with a problem of almost pure skill. It is these ever varying gradations of skill and chance that give the game its chief interest as a scientific pastime.

In order to become a skillful player, it is necessary to bear in mind that the game is not one of any given player's hand against the other three, but a combination of two against two. In order that two partners shall play their hands to the best advantage, they must strive, as much as possible, to play the two hands as though they were one. To this end, it is advisable that they should pursue some uniform system of play, in order that each partner shall understand the plans of the other, and so be placed in the most favorable position to assist him in carrying them out. The experience of the last hundred years has developed a system of play tending to this result. Of this we proceed to give an epitome.

The first, or, as it is commonly called, the *original* lead should be from the player's strongest suit. A strong suit is one that contains either a large number of cards (four or more) or several high cards. The suit containing the largest number of cards (numerical strength) is the one to be mostly preferred. The object aimed at in opening with the strongest suit is to exhaust the cards of that suit from the other hands. When this object is accomplished, the cards of the suit which remain in the leader's hand (called long cards) obtain a value which does not intrinsically belong to them. They often become of great service, for when led, they either compel the adversary to trump, or they make tricks. And when trumps are all out, the player who has the lead makes as many tricks as he has long cards.

On the other side, by opening weak suits, there is considerable risk of sacrificing partner's strength, and of leaving long cards with the opponents.

Some players are prone to lead single cards, but experience shows that weak leads, as a rule, do more harm than good. Sometimes a trick or two is made by playing a trumping game; but the chances are that such tactics sacrifice partner's hand, and clear the suit for the adversaries.

The proper card of the strong suit to lead is, as a rule, the lowest. The intention is for the third player to play his highest, and so to assist in clearing his partner's strong suit. Moreover, if the leader keeps the best cards of his suit in his own hand, he has a fair chance of getting the lead again when his suit is nearly or quite established. But with ace and four or more small ones, it is considered best to begin with the ace, lest the ace be trumped, second round. Also, with a strong sequence in the strong suit, it is best to lead one of the sequence first, lest the adversaries win with a very small card. The following are the principal leads from sequences:

From ace, king, queen—lead king, then queen.

From ace, king, and small—lead king, then ace.

From ace, queen, knave—lead ace, then queen.

From king, queen, knave, and more than one small—lead knave.

From king, queen, knave, and one small—lead king.

From king, queen, and small—lead king.

From king, knave, ten, nine, etc.—lead nine.

From king, knave, ten, and small—lead ten.

From queen, knave, ten, and small—lead queen.

From knave, ten, nine, and small—lead knave.

After the first trick, the lead may remain with the first leader. His best play, as a rule, is to continue his suit. If the lead falls to another player, his play, as a rule, will be to open his best suit; and so on. If the lead falls to the first player's partner, he has

choice of two modes of play. If he has a good strong suit of his own, as, for instance, one of those in the list above, and containing four or more cards, he would, as a rule, open it; if not, he would, as a rule, do well to continue the suit his partner first led; or, as it is commonly called, to return his partner's suit. The object is to strengthen partner by assisting to clear his strong suit.

In returning a suit, if the player has only two cards of it remaining in his hand, he should return the highest; if more than two, the lowest. The exception is, if he has the winning card, he should return that irrespective of the number of other cards in the suit. The reason of this rule is that, with but two cards of the suit remaining, the player is weak in the suit, and he is therefore bound to sacrifice his good card to support his partner. But with three or more remaining after the first round, he is strong, and is therefore justified in calling on partner to support him.

This rule of play is most important. It should be carefully observed with even the smallest cards, as it enables partner to count the situation of the remaining cards. For example: A leads a suit in which C (his partner) holds ace, three, and two. In returning A's suit, after winning with the ace, C is bound to return the three and not the two. When C's two falls in the third round, A will know that his partner has no more of the suit. But suppose C's cards to be ace, four, three, and two. In returning the suit, C is bound to choose the two. Then after the third round, A will conclude with certainty that C has at least one more card in the suit.

Late in a hand, the considerations with regard to the lead vary. If there is no indication to the contrary, it is best for each side to continue the suits originally opened by them. But the fall of the cards may show that it is disadvantageous to persevere in the suits first led. In such cases, the player must have recourse to other and weaker suits. The general rules to be observed here are—to choose a suit in which there is reason to infer that the right-hand adversary is weak; or—but this is less favorable—one in which the left-hand adversary is strong. In either case, if the suit chosen contains but three cards, none higher than knave, or only two cards, it is generally right to lead the highest.

The second player, as a rule, should play his lowest card, in order to preserve his strength in the leader's suit. The first trick in the suit is left to partner, who has an even chance of holding a better card than the third player. But if the second hand has a strong sequence, he should play the lowest of the sequence, by which partner's hand may be saved, and a high card still remain over the original leader.

The following are the principal sequences:

With ace, king, queen—play queen.

With ace, king, etc.—play king.

With king, queen, knave—play knave.

With king, queen, etc.—play queen,

With queen, knave, ten—play ten.

With queen, knave, and one small—play knave.

When a high card is led, it is sometimes advisable for the second player to cover it with a higher one. The shortest rule is to put an honor on an honor, if with but two or three cards of the suit. With king or queen, and four of the suit, it is better to pass an honor led.

When the second hand has none of the suit led, he should, as a rule, trump, if he has but two or three trumps; but he should not trump a losing card if he has more than three trumps, the reason of which will be explained when treating of the management of trumps.

The third hand, as a rule, plays his highest card in order to support partner in his suit. The exceptions are, with ace, queen, etc., the queen is to be played; and if partner has begun with a high card, it is often right to pass it.

The management of trumps varies according to whether the player is strong or weak in them. If strong (i.e., with four or more), they should not be used for trumping, if it can be avoided, but should be kept together, in hopes of establishing a suit, and of remaining with the long trump, with which to get the lead after the other trumps are out, and so to bring it in. Thus, if the opponents lead a losing or doubtful card, it is better, as a rule, not to trump it when holding four trumps. But if the opponents lead a winning card, it is, as a rule, better to trump it, though holding four trumps, than to pass it in hopes of bringing in a suit.

With five trumps, the chance of succeeding in exhausting the opponents' hands, and of remaining with the long trump, is so considerable, that a player having five or more trumps, should lead them; and as number is the principal element of strength, he should not be deterred from leading trumps merely because the fourth hand has turned up an honor.

With four trumps only, it is better first to lead the strong suit. When the adversaries' hands are cleared of that suit, or so far cleared that the holder of the long cards in that suit commands it, it is, as a rule, safe to lead from four trumps.

As a rule, less than four trumps should not be led from. But a player is justified in leading from weak trumps, if he holds winning cards in every suit; if the adversaries are both trumping a suit; or if the game is lost, unless partner has strength.

It is most important to return partner's trump lead at once, unless he has led from

weakness; for partner, by leading trumps, declares a strong game, and it is then the best policy to abandon one's own plans, and to support his.

It follows that a player should not, as a rule, lead a card for his partner to trump, unless he has four or more trumps; for with less than four trumps, the player is weak; and if he forces his partner to trump, partner is weakened also; and the chances are that by weakening partner under such circumstances, the command of trumps will remain with the adversaries.

But a player may force his partner, although weak himself, if partner has already been forced, and has not afterward led trumps; if partner has already declared weakness in trumps, as by trumping a doubtful card second hand; if two partners can each trump a different suit; and when one trick from partner's hand wins or saves the game.

The same considerations which make it inexpedient to force partner when weak one's-self show the advantage of forcing a strong trump hand of the opponents.

There are yet some general rules of play which have not been explained.

The second, third, and fourth players should always play the lowest of a sequence. The rule here given is in conformity with the play that would naturally be adopted in playing cards that are not in sequence; and by keeping to a uniform plan, players are enabled to infer what cards their partner does or does not hold. It is true that the adversaries often gain the same information; but it is found by experience that it is of more advantage to inform partner than to deceive the opponents.

As a rule, it is advisable to lead out the winning cards of partner's suit. The presumption is that he has led from his strong suit; and by leading out the winning cards, the suit is cleared for him, and his long cards are not obstructed. The reverse applies to suits led by the adversaries. It is mostly right to retain the winning cards of such suits as long as possible, in order to stop the establishment of them.

When a player has none of the suit led, he should, as a rule, throw away from his weakest suit; for by discarding from a strong suit, its numerical power is damaged. But when the adversaries have shown great strength in trumps, it is not advisable to keep small cards of a long suit, as it is not likely that it can ever be brought in. Under such circumstances, the player should throw away from his best protected suit, and keep guards to his weaker ones.

Players should watch the cards as they are played, and endeavor to infer from them where the others lie. Thus, if a player wins a queen with an ace, it may be inferred that he has not the king, the rule being to win with the lowest; if a player leads trumps at starting, it may be inferred, as a rule, that he is strong in trumps, or has a very fine hand. By recording in this way, and by counting the number of cards played in each suit, skilled players will often, toward the close of a hand, know the position of all the important cards remaining in; and by means of this knowledge, they will be able to play the end of the hand to the same advantage as though they had seen all the cards.

And lastly, and most important of all, players should play to the score. Thus, wanting but one trick to save or win the game, a winning card should be played at once. The example is stated as for one trick; but it should always be kept in mind how many tricks are requisite to win or save the game, or even a point, and the play should be varied accordingly.

The previous condensed outline embodies the principal rules of play. For more detailed information, the reader is referred to prof. P.'s essay on the modern scientific game (Longman, Green, etc.); *Cavendish's Principles of Whist* (De la Rue & Co.); and "J. C.'s" Treatise on the game (Harrison).

WHISTLER, GEORGE WASHINGTON, 1800-49; b. Ind.; graduated at West Point, and was appointed to the artillery. He was for a time assistant teacher of drawing at West Point, and was attached to the n. boundary commission, 1822-28. He resigned in 1833, and for the next 9 years had charge of the construction of several railroads, including the Boston and Providence, and the Western (Mass.). In 1842 he went to Russia to direct a proposed system of internal improvements. He directed not only the construction of the railroads, but the manufacture of the rolling stock, etc.

WHISTON, WILLIAM, was b. Dec. 9, 1667, at Norton, in Leicestershire, of which place his father was rector. His earlier education he received at home; subsequently, he became the pupil of a Mr. Antrobus at Tamworth, and finally he went to Cambridge, where he greatly distinguished himself, chiefly as a student of mathematics. In 1690 he took his degree, and obtained a fellowship in 1693. The year after he became chaplain to Dr. More, bishop of Norwich; and in 1698, having been presented to the living of Lowestoft, in Suffolk, he was married to Miss Antrobus, the daughter of his old preceptor, his fellowship being thus forfeited. Meantime, in 1696, had appeared his *Theory of the Earth*, a work which, despite, or perhaps in virtue of, the oddity of certain of its speculations, procured him a considerable reputation. That his genuine claims as a man of science were considerable, is made clear by the fact that at 1703, by the express influence of sir Isaac Newton, whose acquaintance he had made some years previously, he was appointed to succeed him in the Lucasian professorship at Cambridge. On receiving this appointment, he gave up his living, and again settled himself at the university. In addition to the duties of his chair, he engaged in clerical work; and such was

his success as a preacher, that he would probably have attained high position in the church, had not the development of his theological opinions led him into Arian heresy—his frank and fearless avowal of which at once in his preaching and his writings led, in 1710, to his expulsion from his professorship and the university. In the same year appeared the most noted of his original writings, *An Historical Preface to Primitive Christianity Revived*. His subsequent prosecution in the church courts forms a curiously complicated chapter in the history of such matters. The result was, that after five years of vexatious suspense, during which the proceedings swayed hither and thither in the strangest way, they proved in the end abortive, and Whiston was permitted to remain formally a member of the church of England. By many of the clergy, however, much dissatisfaction was expressed; the famous Dr. Sacheverel in particular thundered from the pulpit against the delinquent, and refused to admit him to communion—an example which was followed by others. It seems significant of the social stigma attached to him in the minds of the orthodox, that when Halley, in 1720, proposed him as a member of the royal society, his old friend Newton successfully opposed his admission. Whiston himself, the most amusingly vain of men, remained indeed deeply convinced that Newton's conduct was dictated by jealousy of his superior scientific genius—a notion in which he probably found not many to agree with him. Having no ostensible means of livelihood, Whiston was frequently reduced to great straits; but he had kind friends, who were ready to assist him at need. In the dissemination of his religious opinions he continued unwearied; his publications on the subject were numerous; also, he occasionally delivered lectures; and he instituted a religious society, which had meetings at his own house. He also busied himself much with scientific crotchets, chief among which was a scheme for calculating the longitude, of the success of which he was assured. He died on Aug. 22, 1752, at the great age of 85. Of all his numerous works, a translation of Josephus was the only one which continued for a time to perpetuate the name of its author; and of this there have been several reprints. His memoir of his own life (published in his lifetime in 3 vols. 1749–50) is a curious specimen of self-portraiture, and conveys a very vivid image of this strange, whimsical, eccentric, but thoroughly honest and conscientious man.

WHITAKER, DANIEL K., LL.D., b. Mass., 1801; graduated at Harvard, 1820; studied law, and settled in South Carolina and became the law partner of ex-governor Wilson of that state. Though successful at the bar, he is best known as the founder and editor of the *Southern Literary Journal*, *Whitaker's Magazine*, and the *Southern Quarterly Review*. The last was started in 1841, and for twenty years had a high reputation. In 1866 Mr. Whitaker became editor of the *Monthly Review*, published at New Orleans.

WHITAKER, NATHANIEL, D.D., 1732–94; b. N. Y.; graduated Princeton college under president Burr; was ordained and settled as a Congregational minister at Norwich, Conn. In 1765 he visited Great Britain with the rev. Samson Occum to procure funds for the support and enlargement of the school at Lebanon, Conn., under the care of the rev. Eleazar Wheelock. They were cordially received in England and Scotland, and obtained £12,000. This school, established for the education of the Indians, was in 1770 removed to Hanover, N. H., was chartered by governor Wentworth under the name of a college, and called Dartmouth in honor of lord Dartmouth, who had generously contributed to the American agents for the Indian school. Dr. Whitaker on his return was settled at Salem, Mass.

WHITAKER, OZI WILLIAM, D.D., b. Mass., 1830; graduated Middlebury college, 1856; principal of the North Brookfield high school for several years; studied theology at the Protestant Episcopal seminary, New York; rector of St. John's church, Gold Hill, Nev., 1863–65; of St. Paul's, Eaglewood, N. J., 1865–67; of St. Paul's, Virginia, Nev., 1867; elected missionary bishop of Nevada and Arizona, 1868.

WHITBY, a parliamentary borough, market-t. and thriving sea-port in the north riding of Yorkshire, on both sides of the mouth of the Esk, about 50 m. n.e. of the city of York by railway, and 42 in a straight line. A stone bridge with a swivel, by which vessels are admitted into the inner harbor, connects the two parts of the town. Two piers, of which the w. one is about 1000 ft. long, run out into the German ocean, and protect the outer harbor, and it is further protected by two inner piers, which break the force of the waves during storms. On a cliff about 350 ft. high stands the parish church, which is approached from the town below by a flight of nearly 200 steps. There are dry docks for the building and repair of ships; iron and jet ornaments are extensively manufactured—the jet found in the vicinity having a world-celebrity. Alum and ironstone—the latter found in great quantities—are exported. Of late, Whitby has risen into importance as a watering-place. In 1872, 398 vessels of 22,329 tons entered, and 23 of 1277 tons cleared the port. Pop. '71, 13,094.

The Saxon name of the place was Streonshalch, but when the Danes took possession of it they called it Whitby (white town), just as they changed the Saxon North-woerthing into Deoraby or Derby. The termination *by*, which is characteristic of Danish settlements, is a corruption of the old Norse *byr*, modern Icelandic *boer*, a dwelling, farmstead, town. In Devon the suffix occurs in the form *bere* or *beer*, as in Rockbere, Larkbeer.

WHITBY, DANIEL, D.D., 1638-1726; b. England; educated, Oxford; prebendary of Salisbury, 1668; precentor of Salisbury, 1672; rector of St. Edmund's church, Salisbury. Bred a Calvinist he became a zealous Arminian, and through the influence of Dr. Clark's doctrine of the trinity adopted Arian views. The following are some of his publications: *The Futility of the Roman Church Demonstrated; Treatise of Traditions; The Protestant Reconciler; A Paraphrase and Commentary on the New Testament; Concerning the True Import of the words Election and Reprobation*, often reprinted as *Whitby on the Five Points*.

WHITCHURCH, a small market-t. of Shropshire, on a height 20 m. n.e. of Shrewsbury by railway. Trade in malt, hops, and shoes is carried on. Pop. '71, 3,696.

WHITCOMB, JOHN, about 1720-1812; b. Mass. In 1755 he took part in the Crown Point expedition in command of a regiment. Early in the revolution he raised a regiment and brought it to Boston. He was commissioned brig.-gen. by congress in 1775, and maj.-gen. the same year. In 1776 he retired from the army owing to ill health.

WHITE, a co. in central Arkansas, having the White river for its e. boundary, drained by Little Red river and Bayou des Arc; 1044 sq.m.; pop. '80, 17,794-17,550 of American birth, 2,032 colored. Co. seat, Searcy.

WHITE, a co. in extreme n.e. Georgia; 250 sq.m.; pop. '80, 5,341-5,336 of American birth; 590 colored. Gold is found in considerable quantities. Co. seat, Cleveland.

WHITE, a co. in s.e. Illinois, drained by the Wabash river, separating it from Indiana, and also by the Little Wabash; 480 sq.m.; pop. '80, 23,089-22,386 of American birth; 533 colored. Co. seat, Carmi.

WHITE, a co. in n.w. Indiana, drained by the Tippecanoe river; 504 sq.m.; pop. '80, 13,795-12,967 of American birth; 3 colored. Co. seat, Monticello.

WHITE, a co. in central Tennessee, having the Caney fork of Cumberland river for its s. and s.w. boundary; 672 sq.m.; pop. '80, 11,176-11,143 of American birth; 1001 colored. Co. seat, Sparta.

WHITE, ANDREW DICKSON, LL.D.; b. N. Y., 1832; educated at Yale college, and the university of Berlin. He was professor of history and English literature at the university of Michigan, 1857-62, and became president of Cornell university in 1866. He was a member of the N. Y. state senate in 1863-66, one of the commissioners to San Domingo in 1871, and minister to Germany, 1879-81. Among his works are *Lectures on Mediæval and Modern History* (1861), and *The Warfare of Science* (1876).

WHITE, GILBERT, author of the *Natural History and Antiquities of Selborne*, was b. at Selborne, in Hampshire, on July 18, 1720. Educated at Oriel college, Oxford, he received his M.A. degree in 1746, and in 1752 he was made a senior proctor of the university. At an early period of his life he retired to his native village, to indulge his taste for literature and natural history; and there he died on June 20, 1793. His charming *Natural History and Antiquities of Selborne*, which has made White an indisputable English classic, was published in 1789. Probably no book on natural history has been more frequently reprinted. Among the various editions may be mentioned that of professor Bell (1877), and the one by Frank Buckland, with a chapter on antiquities by lord Selborne (1875). After White's death, Dr. Aikin published a selection from his natural history journal, under the title *A Naturalist's Calendar*.

WHITE, HENRY KIRKE, was b. on Mar. 21, 1785, at Nottingham, in which place his father was a butcher. At the age of 15 he was apprenticed to an attorney; and, while in his business he showed exemplary diligence, his leisure hours were passionately devoted to intellectual pursuits, and especially to the cultivation of poetry. He also became a member of a literary society in Nottingham, and began to attract notice by his fluency and ability as a speaker. To the *Monthly Mirror* he was wont to send contributions, and the merit of his verses drew to him the attention of Mr. Hill, its proprietor. Acting on the advice of this gentleman and Mr. Capel Lofft, who also took a generous interest in him, he published in 1804 a small volume of poems, which was cruelly treated by the critics, and found little acceptance with the public. It was the means, however, of securing him influential friends, notably Southey, and the rev. Mr. Simeon, through whose influence a sizarship in St. John's college, Cambridge, was procured for him. In his studies he highly distinguished himself; but the ardor with which they were pursued speedily proved the ruin of a constitution at all times delicate; consumption rapidly developed itself, and he died Oct. 19, 1806. The year after two volumes of his *Remains* were published by his friend Southey, to whom his MSS. had been intrusted, prefaced by a pleasing memoir of the deceased poet. White's poetry, however, is now almost forgotten.

WHITE, Rev. JOSEPH BLANCO, was b. at Seville, in Spain, on July 11, 1775. His father was a merchant there of Irish parentage, who had married a Spanish lady of old Andalusian family. Finding his father's counting-house on trial not at all to his mind, he quitted it to prepare himself for holy orders, and in 1799 he was ordained a priest. But, born with a mind curiously restless and inquisitive, he ceased in no long time to

find himself at home in the Romish communion; and in 1810 he came to England, which he never afterward quitted. Joining himself to the English church, he seems to have meditated becoming one of its clergymen; an intention which it was quite as well he did not carry out, inasmuch as his speculations rapidly led him to results not recognized by English orthodoxy. On coming to England he settled himself in London, where for some years he conducted a monthly Spanish paper called *El Español*. On the cessation of the peninsular war, in 1814, this publication ceased also, as having no longer a *raison d'être*; but meantime its services to the government of the day had been such as to secure for its editor a pension for life of £250 per annum. Subsequently Mr. White lived chiefly in London, employed as a man of letters. Though in literary circles recognized as a man of fine talent, and known as a contributor to the *Quarterly* and *Westminster Reviews*, and other high-class periodicals, he scarcely succeeded in making a permanent impression on the public by any of his more formal publications. Of these the most important were: *Letters from Spain* (1822), contributed some years before to the *New Monthly Magazine*; *Practical and Internal Evidence against Catholicism* (1825); *Poor Man's Preservation against Popery* (1825); and *Second Travels of an Irish Gentleman in Search of a Religion* (2 vols. 1833). He died on May 20, 1841, in Liverpool, whither he had removed some years before. In 1845 there was given to the world, as his legacy to it, by much his most striking and valuable work, *The Life of the Rev. Joseph Blanco White, written by himself, with portions of his Correspondence*; edited by John Hamilton Thom (London, 3 vols. 8vo). This book, at the time of its appearance, excited a good deal of interest, and is still eminently worth referring to. The curious picture it presents of a mind at once pious and skeptical, longing and sorrowing after a truth which it can nowhere find, or finding, contrive to rest in, has, in the present unsettled state of religious opinion, a very particular significance. Poor White's life-long "search for a religion" seems not to have been a successful one, and to have landed him at the last in a condition of nearly entire skepticism.

WHITE, PEREGRINE, 1620-1704; the first English child born within the limits of New England. His birth was on the *Mayflower*, in Cape Cod harbor, Nov. 20, 1620. After his father's death his mother married gov. Edward Winslow, thus being the first marriage in New England. It is recorded that Peregrine was "vigorous and of a comely aspect." He held several military and civil offices, and died at the good old age of 84 years.

WHITE, RICHARD GRANT, b. New York, 1822; educated at the university of New York, and called to the bar. He soon devoted himself entirely to newspaper and literary work, and especially to the study of the English language. His most important work is his *variorum* edition of Shakespeare, containing also a memoir and a critical essay (1857-62). Among his works are: *Shakespeare's Scholar* (1854); *Essay upon the Authorship of the Three Parts of Henry VII.* (1859); *Memoirs of the Life of William Shakespeare* (1865); *Words and Their Uses* (1870); and *Every-Day English* (1880). He has been a frequent contributor to the *Galaxy*, the *Atlantic Monthly*, and other periodicals. He was formerly connected with the N. Y. custom-house. He is keenly critical of words.

WHITE, WILLIAM, D.D., 1748-1836; b. Philadelphia; graduated college of Philadelphia, 1765; studied theology; went to England and was ordained deacon by the bishop of London, 1770, and priest by the bishop of Norwich, 1772; returning, became rector of Christ church and St. Peter's church, Philadelphia; chaplain to congress, 1777; presided over the first Episcopal convention in America, 1789, and wrote the constitution of the church, which was then adopted; elected bishop of the diocese of Pennsylvania, 1786; consecrated at Lambeth palace by archbishop of Canterbury, 1787. He, with bishop Seabury, revised the Book of Common Prayer for the American Episcopal church. He published *Memoirs of the Protestant Episcopal Church; Comparative Views of the Controversy between the Calvinists and the Arminians; Lectures on the Catechism*. He had a happy combination of intellectual and spiritual qualities for the office of bishop at the organization of the Episcopal church in America.

WHITE COLORS. The principal white pigments used by painters are: (1) *White lead* (see **LEAD**), which is not only used as a color, but forms the body of most oil-paints; (2) *Derbyshire white*, which is sulphate of baryta; (3) *pearl white*, or trisnitrate of bismuth; and (4) *zinc white*, or hydrated oxide of zinc.

WHITE FLUX. See **FLUX**.

WHITE GUNPOWDER is a mixture that was at one time employed in blasting, but is now scarcely ever employed in consequence of the danger attending its preparation, and the facility with which it explodes by friction. Its ingredients are chlorate of potash, dried ferrocyanide of potassium, and sugar.

WHITE LADY, a being who, according to popular legend, appears in many of the castles of German princes and nobles, by night as well as by day, when any important event, whether joyful or sad, but particularly when the death of any member of the family is imminent. She is regarded as the ancestress of the race, shows herself always in snow-white garments, carries a bunch of keys at her side, and sometimes rocks and watches over the children at night when their nurses sleep. The earliest instance of

this apparition spoken of was in the 16th c., and is famous under the name of Bertha of Rosenberg (in Bohemia). The white lady of other princely castles was identified with Bertha, and the identity was accounted for by the intermarriages of other princely houses with members of the house of Rosenberg, in whose train the white lady passed into their castles. In the castle of Berlin she is said to have been seen in 1628, and again in 1840 and 1850. The most celebrated in Britain is the white lady of Avenel, the creation of sir Walter Scott. It was long a common belief in the Highlands that many of the chiefs had some kind spirit to watch over the fortunes of their house. Popular tradition has many well-known legends about white ladies, who generally dwell in forts and mountains as enchanted maidens waiting for deliverance. They delight to appear in warm sunshine to poor shepherds or herd-boys. They are either combing their long hair, or washing themselves, drying wheat, beating flax, or spinning; they also point out treasures and beg for deliverance, offering as reward flowers, corn, or chaff, which gifts turn in the instant into silver and gold. They wear snow-white, or half white, half black garments, yellow or green shoes, and a bunch of keys at their side. All these and many other traits that appear in individual legends may be traced back to a goddess of German mythology who influences birth and death, and presides over the ordering of the household. Still more distinctly the appellation white lady and the name Bertha point back to the great goddess of nature, who appears under various names, and who, as *Berhta* (i.e. the brilliant, shining, white), held her circuit on Twelfth-night and revealed her power. When the legend goes on to say that the Bohemian Bertha of the 15th c. promised the workmen of Neuhaus a sweet soup on the completion of building the castle, and that this soup, along with carp, is still given in remembrance of it to the poor on Maundy Thursday, we recognize again the festival dishes consecrated to Berhta, such as fish, oatmeal, gruel, or dumplings, etc., which it is still customary to eat about the time of Twelfth-night and Christmas in most districts of Germany.

WHITE LEAD. See LEAD.

WHITE MOUNTAINS, a mountain-chain of New England, regarded as an outlier of the Appalachian range, commences at the headwaters of the Aroostook river, in Maine, where its first summit is mount Katahdin, and extends in a broad plateau, from 1600 to 1800 ft. high, w. by s. nearly across New Hampshire, where it has twenty bold peaks, with deep, narrow gorges, wild valleys, beautiful lakes, lofty cascades and torrents, forming the "Switzerland of America," and a favorite resort of summer tourists. Mount Washington, the highest summit in New England, 6,285 ft., has a practicable carriage-road and a hotel on its summit; mount Pleasant the second of the group, is 4,762 ft.; the lesser are named Franklin, Monroe, Jefferson, Adams, Madison. In the Franconia group are Lafayette, 5,300 ft., and Mossehillock, 4,636. These mountains furnish the chief sources of the Connecticut, Merrimack, and Androscoggin rivers. The rocks are ancient metamorphic, with naked granite and gneiss. The Ammonoosuck river falls 5,000 ft. in 30 m., the Androscoggin 200 in a mile. Five narrow and precipitous notches seem to have been rent in the mountains, and give passage to as many rivers.

WHITE PINE, a co. in e. Nevada, a part of the Great Basin, crossed by mountain ridges, bordering on Utah; 6,700 sq.m.; pop. '80, 2,682—1,676 of American birth, 395 colored. Silver from quartz rock is largely exported. Co. seat, Hamilton.

WHITE PLAINS, a t. the co. seat of Westchester co., N. Y., on the Harlem railroad. Here in Oct., 1776, the battle of White Plains was fought. Oct. 12, gen. Howe having occupied Throgg's Neck in Westchester co., Washington sent on a corps to White Plains, and began to evacuate Manhattan island. On the 23d Washington took up his quarters at White Plains. After several skirmishes, Howe, whose camp was at Scarsdale, near White Plains, went on with 13,000 men. On the 28th Washington, with a larger force, had a strong position, and Howe, not caring to attack him, dispatched some 4,000 men to seize on Chatterton hill, w. of the Bronx river. The 1400 Americans, under McDougall, who occupied the hill, were forced to retreat to Washington's camp, losing 100 killed and wounded, and some 80 prisoners; the British loss was 229. While Howe was waiting for re-enforcements, Washington, on the evening of the 31st, occupied the high ground above White Plains. Five days later Howe withdrew to Dobbs ferry. On Nov. 9 Washington began the removal of his troops to New Jersey.

WHITE PRECIPITATE. See MERCURY.

WHITE RIVER, a river of Arkansas and Missouri, rises in the Ozark mountains, flows n.e. into Missouri, then turning e. and s.e. into Arkansas, drains the north-eastern portion of the state, and, flowing southerly, empties itself into the Mississippi near the mouth of the Arkansas. It is 800 m. long, and navigable 350 miles.

WHITE RIVER, formed by the junction of two forks in Knox co., Ind., flows in a generally s.w. direction, entering the Wabash about 25 m. below Vincennes, only 30 m. from the junction. The w. fork is nearly 300 m. long, and on it are situated Anderson, Muncie, and Indianapolis. The e. fork, sometimes called the Blue river, has a length of 270 miles.

WHITE SEA (Russ. *Bjeløje-nore*), an arm or great bay or inlet of the Arctic ocean, which, between cape Kanin on the Kaninskaia peninsula, and cape Sviatoi on the Kola

peninsula, penetrates the Russian government of Archangel southward to lat. 64° north. At its entrance between capes Kanin and Sviatoi it is 100 m. broad; after penetrating the land 150 m. in a south-easterly direction, it narrows to a width of 35 m.; but after sweeping s. for 200 m., it again considerably widens, forming in the n.w. the gulf of Kandalak, and in the s. and s.e. the great gulfs of Onega and Archangel or Dwina. The White sea covers an area estimated at 47,000 sq.m., and the length of its coast-line is over 1000 miles. The coasts in the n. and e. are mountainous, in other places they are mostly low, and abound in lakes, which communicate with the sea by rivers. The greatest depth of the White sea is 1133 feet. From the middle of August ice forms on the coasts sometimes to the width of 30 m., and is not melted till the following July.

WHITE SULPHUR SPRINGS, a watering-place in Virginia, on Howard's creek, 205 m. w. of Richmond. Pop. '70, 976. It has hotel accommodation for 1500 guests. The spring is in the lowest part of a beautiful valley, and is covered by a dome supported by 12 Ionic columns, and surmounted by a statue of Hygeia; it is 2,000 ft. above tide-water; yields 30 gallons per minute of water at 62° Fahr., impregnated with sulphates of lime, soda, magnesia, carbonate of lime, chlorides of calcium and sodium, iron, iodine, sulphur, carbonic acid, sulphureted hydrogen, oxygen, nitrogen. It is considered efficacious in dyspepsia, liver diseases, gout, rheumatism, and diseases of the skin and kidneys. The red, salt, and blue sulphur springs, at a distance of 22 to 24 m. from the above, are also much resorted to.

WHITE SWELLING. See JOINTS, DISEASES OF.

WHITE VITRIOL. See ZINC.

WHITE-WASH, slaked quicklime, reduced to the consistency of milk by means of water. It is used for coloring walls, and as a disinfectant. If merely for coloring, a little size is added, but not when used for sanitary purposes.

WHITE-WOOD BARK. See CANELA.

WHITEBAIT, a small fish, called by Valenciennes *rogenia alba*, and for which he constituted the genus *rogenia* as a distinct genus of the herring family (*clupeidae*), but which is now generally regarded by naturalists as merely the fry of the herring. The whitebait fishery is actively prosecuted on some parts of the British coast, particularly in the estuary of the Thames, where the whitebait is very abundant in spring and summer, beginning to appear in the end of March or early in April. Adult whitebait are caught on the coasts of Kent and Essex during winter, and in this condition are about 6 in. in length. Whitebait is also found in the Forth. It is much in request as a delicacy for the table, forming a favorite dish of epicures. At the time when ordinarily captured, whitebait are only from an inch and a half to 4 in. in length. They are caught by means of bag nets sunk 4 or 5 ft. below the surface of the water. For several months they continue to ascend the river in shoals with the flood-tide, and descend with the ebb-tide, not being able to live in fresh water. They are fried with flour or crumbs; they are often laid on a napkin and sprinkled with fine flour and a little salt, rolled about till well covered with flour, and then thrown into a pot of boiling lard, where they remain till they are of a pale straw color. Londoners resort to Greenwich and Blackwall to enjoy whitebait dinners. It has become the practice for her majesty's ministers to repair to Greenwich for a whitebait dinner every year before the prorogation of parliament in autumn. Some of the corporations of London indulge in a similar annual festivity. The whitebait has the body more compressed than the mature herring; the belly is serrated; the lower jaw is longer than the upper; the scales are very soft, small, and thin, and very easily rubbed off; the color is silvery white, greenish on the back. The food of the whitebait seems to consist of minute crustaceans. It seems probable that the fry of all the British *clupeidae*—the pilchard, the sprat, and the shad—are indiscriminately taken and used like the fry of the herring, under the name of whitebait.

WHITEBOY, the name of an illegal association of the peasantry in Ireland, which for a long series of years was the fruitful source of agrarian outrage, sometimes of a very revolting and sanguinary character. The association had its origin in the early years of the reign of George III.; and first took an organized form in the county of Tipperary, where it appeared in the shape of a united resistance to an attempt on the part of certain proprietors to inclose and appropriate lands up to that time common. The movement at the beginning was confined to throwing down the newly erected fences, and destroying the inclosure, from which circumstance the rioters were in the first instance called "levelers;" but their views soon extended further, and they addressed themselves to the redress, first, of the oppressive exactions of tithes, and afterward of various other grievances, especially those connected with the tenure of land. The name of whiteboys was given to them in consequence of their wearing white shirts in their nightly expeditions. Many acts of cruelty and outrage having been committed, a special commission was issued in 1762 for the trial of the offenders; but the repression was only partial and temporary, and whiteboyism re-appeared more than once in the southern province. In 1787 a new association, the members of which called themselves the "Right-boys," appeared in the same district, and was made the subject of discussion in the Irish parliament. The conflicts of the northern orangemen (q.v.) and ribbonmen (q.v.) for a time drew attention away from the minor discontents of the south; but the same spirit of secret

combination has continued among the peasantry down to the present day. The shana vests, caravats, Rockites, terry alts, and other more obscure or more local denominations, must be regarded as embodiments of the very same discontent, which has long held its ground among the poorer classes in Ireland, and which, although undoubtedly exaggerated and embittered by the recollections of hereditary wrong inseparable from the condition of a conquered people, are held, even by politicians of moderate views, to have much justification in the social condition of the people, and in certain striking anomalies of the legislature in reference to Ireland. The ground of discontent furnished by the endowment and establishment of the church of a small minority of the population, has now ceased to exist. See FENIAN SOCIETY.

WHITEFIELD, GEORGE, one of the founders of Methodism, was b. in the Bull inn, at Gloucester, on Dec. 16, 1714. He was educated at the grammar-school of his native town, at which he appears to have distinguished himself, especially by elocutionary displays at the annual visitations. On leaving school, he was for a time engaged assisting in the business of his mother, the hostess of the Bull inn; but he obtained admission as a servitor at Pembroke college, Oxford, when in his 18th year. About three years earlier, John and Charles Wesley had laid, in the university of Oxford, the foundations of Methodism—a system which at first resembled the rule of a religious order more than the bond of a religious sect; requiring from its professors ascetic observances and devotion to works of piety and charity. It was not till he had been upward of a year at the university that Whitefield became associated with the Methodists. He at once made himself remarkable among them for zeal, for the austerity of his asceticism, for labor too great for his strength among the sick and the prisoners in the jail. His health gave way, and he had to go home, when his native air soon restored him; after which he carried on at Gloucester the same pious and self-denying practices which he had begun at the university. His conduct drew upon him the attention of the bishop of the diocese, who offered, though Whitefield was only twenty-one, to admit him immediately into orders. The offer was accepted, and Whitefield was ordained a deacon in 1736, before he had taken his degree. He preached his first sermon in Gloucester cathedral, and the effect of it was remarkable. The vehemence and earnestness of his oratory deeply moved the audience; and five persons are said to have been driven mad with fear and excitement. Complaints were made to the bishop; but this good man gave no heed to them—simply saying that he hoped the madness would last to the following Sunday. During the next two years, Whitefield preached with similar results in various churches in England.

Meanwhile, Wesley had been in America establishing missions among the colonists; and in 1738 he desired Whitefield to join him, a request that was immediately complied with. Whitefield had to go to London to make arrangements for his journey; and this visit, though not his first, seems first to have made him known to the inhabitants of the metropolis, upon all classes of whom—fine gentlemen like Chesterfield, and cool skeptics like Bolingbroke, as well as the more mobile crowd—he afterward made an impression such as, probably, no other preacher ever produced. His success in London was immediate, and much exceeded all that had befallen him previously. The doors of the church in which he was to preach were besieged before the dawn; the unlighted streets in the early morning were filled with persons carrying lanterns, making their way to the place of worship many hours before the time of service. This lasted until his departure for America. He was hereafter to be almost as closely connected with evangelical labors in America as in England itself; but on this first occasion, his stay was short—only a few months. He returned to be admitted to priest's orders, and to collect funds for the establishment of an orphanage in Georgia. He soon went back to America, but not before a beginning had been made of his split with the English church, whose clergy he offended by preaching in the open air, whether he got permission from the parish clergyman or not, and by deviating, whenever he thought fit, from the liturgy of the church. But the remarkable and beneficial effects of his preaching on the rude miners and others who flocked to hear him, consoled him for clerical censures; and after this, he seems to have preached almost by preference in the open air. His second visit to America occupied nearly two years. He came back in 1741.

It was about this time that doctrinal differences led to his separation from John Wesley—both of them being by this time disowned by the established church. Wesley believed and preached the doctrine of universal redemption; Whitefield was a rigid Calvinist. Each thought his belief of the utmost importance, and, in the end, each excommunicated the other. Whitefield's supporters now built him a large shed at Moorfields, near Wesley's chapel—which, being temporary, was known as the tabernacle; and his preaching gathered immense audiences around him. But he had no talent for organization; and as soon as he went away on his frequent and protracted journeys, his supporters began to disperse. But that the countess of Huntingdon, a lady of wealth and of abilities, became a convert to his views, Whitefield, in all probability, would not have founded a sect. But this lady appointed him her chaplain; she built and endowed chapels to maintain his Calvinistic doctrines; and thus a slight memorial of Whitefield's preaching, though it more directly commemorated the zeal and energy of lady Huntingdon, remains in what is known as the Huntingdon connection.

One of his most famous missionary journeys was that which he made to Scotland in 1741. He went to Scotland on the invitation of Ralph and Ebenezer Erskine, well known as leaders of a secession from the church of Scotland; but his notions were too catholic for his friends; he was as ready to preach in a parish church as to a seceding congregation, and more ready still to preach in the open air; and the Erskines soon differed from and separated from him. That the impression he made upon the people of Scotland was very strong and very general, may be inferred from the fact that the leading corporations of Scotland—Edinburgh, Glasgow, Aberdeen, Stirling—admitted him to their citizenship. At Cambuslang, in Lanarkshire—a mining district, mainly inhabited by rude colliers, then *adscripti glebe*—his preaching produced one of the most remarkable “revivals” of modern times; many thousands were stricken with concern about their souls, and violent physical manifestations followed upon their excitement—foaming at the mouth, bleeding at the nose, convulsions—which, by many who read of them, were attributed to divine influence, by others to the devil. It was on his return from this visit to Scotland, that Whitefield, making a stay in Wales, met and married a widow, a Mrs. James. His marriage, like that of Wesley, was not a happy one; and it is recorded that the death of his wife, when it occurred, “set his mind much at liberty.”

To America, Whitefield paid seven visits, several of which lasted for two or three years. He set out for America for the last time in 1769. He was ailing at the beginning of the voyage; he was ill at the end of it; and he died somewhat suddenly not long after his arrival in America, at Newberry, near Boston, on Sept. 30, 1770. A collection of his sermons, letters, and controversial writings was published in the following year (*The Works of the Rev. George Whitefield*, 6 vols. Lond., 1771); and in 1772 were published his memoirs, by Dr. Gillies. His writings do not sustain the impression which would be derived from the accounts of his preaching. They show him as a man of somewhat slender talent and common-place quality of mind; quite unlearned; entirely free from the casuistical turn, as well as deficient in the worldly knowledge and prudence, for which Wesley, like many other enthusiasts, was pre-eminent. His success as a preacher seems to have been in no small degree due to a sonorous but expressive voice; no doubt it was mainly due to the earnestness of his faith, to the fluency and rude strength of his homely language, and to that vehemence and impetuosity of nature which, perhaps, is the thing most distinctive of the orator. Of the *Memoirs of the Life and Character of George Whitefield*, by J. Gillies, D.D., of the College church, Glasgow, originally published at London in 1772, subsequent editions, containing additional matter, appeared in 1798, in 1811, 1812, 1813, and in 1827. An anonymous *Life of George Whitefield*, founded upon his journals and letters, and borrowing largely from the work of Dr. Gillies, appeared at Edinburgh in 1826. *Whitefield's Life and Times*, by Robert Philip, D.D., was published at London in 1837; and there has since appeared *George Whitefield: a Light rising in Obscurity*, by Andrews (Lond. 1864); and, in 1876, another full memoir by Tyerman.

WHITEFISH, *Coregonus albus* (see COREGONUS), a fish of the family *salmonide*, of the same genus with the gwyniad, vendace, powan, pollan, etc. It is found in the lakes and large rivers of North America, from the St. Lawrence and its tributaries to the Arctic regions, and is one of the most valuable of American fresh-water fishes, abounding over a great extent of country, and being excellent for the table. It is the *attihawmeg* of the north-western Indians. The body is elongated but thick, the head small and the muzzle pointed, the tail forked, the scales large. The mouth is destitute of teeth. It sometimes attains a length of two feet and a half, and weighs ten pounds. It is bluish-gray on the back, lighter on the sides, and white below. It spawns in October, proceeding from the lakes up the rivers for this purpose. It usually swims in shoals, like its small British congeners. It feeds chiefly on insects and entomostraca. It is caught by nets, which are often spread under the ice, and the fishery is attended with much labor and exposure. The Indians sometimes spear it through holes in the ice. The whitefish forms the principal food of many Indian tribes and of the fur-traders during great part of the year. It is often salted by them. The flesh is bluish-white, changing to a pure white when boiled, whence the name. The most southern lake in which the whitefish is found is lake Champlain. No fresh-water fish better deserves to be made the subject of piscicultural experiments than the whitefish, and its acclimatization in Britain would probably be as easy as it is desirable.—An allied species, the OTSEGO WHITEFISH (*C. Otsego*), found in lake Otsego, is also of exquisite flavor; but it is now rare.

WHITEHALL, a village of New York, at the head or southern extremity of lake Champlain, and termination of the Troy and Champlain canal, with important railway and steamboat connections, and water-power for saw and flouring mills, machine, woolen, and carpet factories. It was settled by maj. Philip Skene in 1761, and called Skenesborough; in the war of 1812 it was an important military depot. Pop. '70, 4,322.

WHITEHAVEN, a parliamentary borough and sea port of Cumberland, near the point where the estuary of the Solway firth joins the Irish sea, 40 m. s.w. of Carlisle by railway, 36 in a straight line, and 34 m. n.e. of Ayre point, the northern promontory of

the isle of Man. It contains a market-house, custom-house, baths, and a theater, as well as the West Cumberland infirmary. The harbor is commodious, but is now dry at low water. The sources of the prosperity of the town are its vicinity to extensive collieries—some of which extend beneath the town and stretch out under the sea—and the extraordinary abundance and richness of the hematite iron ore found in the neighborhood. Coal and iron mines are numerous; there are iron-smelting works, and iron and brass foundries—the manufactured iron being shipped mostly to the Welsh and Irish markets. There are dry docks for the building and repair of vessels; and rope-making and the manufacture of thread and sail-cloth are important branches of trade. Whitehaven returns one member to the house of commons. In 1877, 2,418 vessels, of 305,248 tons, entered and cleared the port. Pop. '71, 18,451.

WHITEHOUSE, HENRY JOHN, D.D., D.C.L.; 1803-74; b. New York; graduated, Columbia college, 1821, and at the general Episcopal seminary, New York, 1824; rector of St. Luke's, Rochester, 1829-44; St. Thomas's, New York, 1844-51; consecrated assistant bishop of Illinois, 1851, and bishop, 1852.

WHITELOCKE, BULSTRODE, 1605-76; b. London; educated at Oxford, but took no degree; read law in the Temple, and in 1626 was among the junior counsel at the impeachment of Buckingham. In 1640 he was elected to the "long" parliament, and, as chairman of the impeachment committee, drew up the charges against the earl of Stafford. He was also one of the Oxford commissioners appointed to treat with Charles I.; a member of the Westminster assembly, 1643; governor of Windsor, 1644; commissioner of the great seal, 1649. He disapproved of the trial of the king, and refused to take part in it. In 1656 he was speaker of the house of commons; was one of Cromwell's lords, and commissioner of the great seal to Richard. He left the MSS. of an autobiography and other works, the most noteworthy of which was a historical account of the important events in which he participated.

WHITESIDES, a co. in n.w. Illinois, having the Mississippi river for its n.w. boundary; drained by Rock river, Elkhorn, and Little Rock creeks; 700 sq.m.; pop. '80, 30,888—26,048 of American birth, 78 colored. Co. seat, Morrison.

WHITETHROAT, *Curruca cinerea*, a bird of the family *Sylviade*, a summer visitant of Britain; plentiful during summer in the greater part of England and in Ireland, but comparatively rare in Scotland. It is also common during summer in the s. and middle of Europe, and is found even in the north. It places its nest in a low bush, or among a tangled mass of brambles and weeds. Its food consists both of insects and berries. Its song is not very sweet, but is delivered with great energy, and it seems to vie with other birds in singing, refusing to be outdone. It is very lively and amusing as a cage-bird, and very easily tamed. The whole length of the whitethroat is 5½ inches. Its plumage is brown, of various shades; the breast and belly brownish-white, tinged with rose-color in the male.—The lesser whitethroat (*curruca sylvicola*) is a species of much rarer occurrence in Britain. The whitethroats belong to the same genus with the black-cap (q.v.) and the garden warbler (*C. hortensis*), which is not uncommon in Britain, and almost rivals the blackcap in the richness of its notes.

WHITFIELD, a co. in n. Georgia, having the Conasauga river for its e. boundary; 360 sq.m.; pop. 80, 11,901—11,801 of American birth, 2,210 colored. Co. seat, Dalton.

WHITFIELD, HENRY, 1597—about 1651; b. England; called to the bar, but afterward took orders in the church of England. He protected some of the Puritan divines during Laud's persecution, to which he was himself finally exposed. He emigrated to New Haven in 1637, and was one of the founders of Guilford. He afterward returned to England, and was minister at Winchester. He wrote on the progress of religion among the Indians, and other subjects.

WHITGIFT, JOHN, the third Protestant archbishop of Canterbury, was b. at Great Grimsby, in Lincolnshire, according to one account in 1530, according to another in 1533. His father was a merchant, and is said to have belonged to a family long established in Yorkshire. His early years were passed within the abbey of Wellow, near Grimsby, of which his uncle was the abbot; and from that he went to St. Antony's school in London, a religious house then in great reputation. About 1548 he was entered at Queen's college, Cambridge. After a short time he removed to Pembroke hall, of which he continued a member till 1555, when he was elected a fellow of Peterhouse. He took orders in 1560, and as he showed a remarkable talent for preaching, the bishop of Ely appointed him his chaplain, and gave him the living of Feversham. In 1563 he was appointed lady Margaret's professor of divinity. In 1567 he became master of Pembroke hall; and in the course of the same year queen Elizabeth, who admired his preaching, and had made him one of her chaplains, appointed him to the mastership of Trinity college. About this time he also obtained the regius professorship of divinity, and took his doctor's degree. He was appointed dean of Lincoln in 1571, bishop of Worcester in 1577, and archbishop of Canterbury in 1583. He at one time held together—under a dispensation from the archbishop—the deanery of Lincoln, the mastership of Trinity, the regius professorship of divinity, and the living of Feversham; and the dispensation enabled him to hold, along with these, any other benefice whatever. This cannot have been often paralleled, even in the history of pluralities. Of course the

man so favored had rendered and was rendering considerable services to the church and to the crown.

His first work, on becoming master of Trinity, was upon a revival of the statutes of the university. He obtained such powers for the heads of houses as enabled them to eject from the lady Margaret's professorship the able and energetic Puritan, Cartwright, on the score of his Calvinistic creed. He afterward, at the request of archbishop Parker, published an answer to an "Admonition of Parliament" (drawn up by a clergyman named Field), presented to the house of commons on behalf of the Puritans, in which it was maintained that, in matters of doctrine and discipline, the church should admit nothing as authoritative but what was contained in the word of God. This work was published in 1572. It has always been held that in it Whitgift vindicated the position of the Anglican church against the Puritans with no less ability than bishop Jewell showed in defending it against the Romanists. He was answered by Cartwright on behalf of the Puritans; he replied, and Cartwright rejoined; and as the works on either side were revised by the most learned and eminent men of the two parties, they give an excellent view of the state of opinions in the Anglican church at this time. After becoming primate, Whitgift labored assiduously to secure uniformity of discipline in the church. He had the full confidence of queen Elizabeth, who placed all the church patronage of the crown, including the bishoprics, in his disposal, and he was armed with full powers for carrying out his design. He required the clergy not only to subscribe to the royal supremacy, the liturgy, and the thirty-nine articles of the church, but also to a set of additional articles framed mainly with the view of purging the church of Puritanism. The bishops were required to administer those tests; and the clergymen who refused to accept them were deprived of their livings. This measure was harshly conceived; but Whitgift is said to have been a kindly man, and to have used his authority over the clergy gently, especially in his later years. He was made a privy councillor in 1585, and in that capacity drew up a set of statutes for cathedral churches, to make their services conform to the principles of the reformation. He was offered the chancellorship by queen Elizabeth, but he declined the office. On the accession of king James, he seems to have been much alarmed for the stability of the system which he had spent his life in rearing; and though the monarch treated him with the utmost observance, anxiety upon this account is said to have hastened his end. He died of paralysis Feb. 29, 1603. He is undoubtedly entitled to rank with the ablest and most distinguished prelates that have adorned the English church. He founded a magnificent hospital and a grammar-school at Croydon.

WHITING, *Merlangus*, a genus of fishes of the family *gadidae*, differing from the cod, haddock, and their congeners (*gadus* or *morhua*), in having no barbule on the lower jaw, and also in their more slender form, which adapts them for pursuing their prey more actively and further from the bottom of the sea. The COMMON WHITING (*M. vulgaris*) is abundant on many parts of the British coast, particularly on the western coasts of Britain, and on the coasts of Ireland; on the northern coasts of Scotland it is comparatively rare. It not unfrequently attains a weight of 3 or 4 lbs.—although the whittings brought to market are seldom of this size; but a whiting has been taken of 7 lbs. weight. The head and body are compressed; the deepest part is at the vent, which is opposite the middle of the first dorsal fin; the upper jaw extends a little beyond the lower; both jaws have long sharp teeth, and there is a triangular patch of teeth on the palate. The scales are small. There are three dorsal fins, and two anal fins; the tail-fin is even. The color is dusky yellow on the back, the sides paler, the belly silver white; there is a black spot on the upper part of the root of the pectoral fin. The whiting is a voracious fish, preying on mollusks, worms, crustaceans, and small fishes. It is caught chiefly by hand lines and long lines; mussels and pieces of cuttle-fish are very generally used for bait. It is in high esteem for the table, and is regarded as particularly delicate and easy of digestion. The flesh is of a pearly whiteness, whence the English name. It very soon suffers change, however, and is in good condition only a short time after being caught; but great numbers of small whittings are sent to market, salted, and dried, under various names.—Another species of whiting, COUCH'S WHITING (*M. albus*), is sometimes taken on the British coasts. It is more abundant in the Mediterranean. It is more slender than the common whiting, and the under jaw is a little longer than the upper. The coal-fish (q.v.) and the pollack (q.v.) also belong to the genus *merlangus*.

WHITING is an impure carbonate of lime, prepared by grinding and then washing chalk, so as to separate the coarser particles from the finer ones, which are collected in masses, and dried. It is extensively used for size-painting, and as an article of household economy, for cleaning plate; and on emergency, may be employed as an antidote (in suspension in milk) in cases of poisoning with oxalic, or one of the mineral acids.

WHITING, WILLIAM, 1813-73; b. Mass.; graduated at Harvard college and the Harvard law school; began the practice of his profession at Boston, and gained a high rank. He was solicitor of the U. S. war department, 1862-65, and had considerable influence on some of Lincoln's measures. He was a member of congress at the time of his death. His most important publication is his work on *The War Powers of the President, and the Legislative Powers of Congress in Relation to Rebellion, Treason, and Slavery* (1862).

WHITLEY, a co. in n.e. Indiana; drained by the Eel river; 320 sq.m.; pop. '80, 16,941—16,206 of American birth, 108 colored. Co. seat, Columbia.

WHITLEY, a co. in s.e. Kentucky, drained by the Cumberland and Laurel rivers; containing the cataract of the Cumberland river, with a perpendicular fall of 60 ft.; 540 sq.m.; pop. '80, 12,000—11,986 of American birth, 247 colored. Co. seat, Williamsburg.

WHITLOW, or **PARONYCHIA**, is a painful inflammatory affection of the phalanges of the fingers, almost always proceeding to suppuration. There are several varieties of this affection, according to the texture primarily attacked; thus, it may be situated in the skin, the cellular (or connective) tissue beneath the skin or under the nail, the tendons or tendinous sheaths running along the fingers, or the periosteum. If the skin be the seat of inflammation, vesicles appear, which soon discharge pus, after which relief is rapidly afforded. Such cases require little care or attention, and give rise to hardly any constitutional disturbance. If the cellular tissue is the primary seat of inflammation, there is a painful sensation of tenseness and throbbing of the part, and often considerable febrile disturbance, until the pus can be evacuated. Although this form is painful, no serious mischief is to be apprehended. When, however, the tendons and their sheaths, or the periosteum, are affected, a much more serious form of whitlow is developed, which has been already discussed in the article **TENDON**. In this form, the suppuration may extend up the arm, and occasion destruction of the joints, and even death.

Whitlow may originate either spontaneously, or after an external injury, such as a prick from a needle, thorn, etc. In the treatment of the milder forms, the finger or thumb should be held for half an hour or longer in water as hot as can be borne, after which lunar caustic should be rubbed freely over the painful surface; and if there are any febrile symptoms, the patient may take a powder, consisting of 4 grains of calomel, 3 of James's powder, and 3 of Dover's powder, at bed-time, to be followed in the morning by an ordinary black draught. The hot local baths should be carried on till matter shows itself; and, as soon as its presence and seat are determined with certainty, an incision should be made to admit of its escape. Even if suppuration has not taken place, a free incision into the inflamed part often gives great relief. There is a pernicious popular idea that the application of cobblers' wax, or some other stimulating substance, will draw the inflammation to the surface, and bring the whitlow "to a head." There is reason to fear that a considerable number of fingers are annually sacrificed to this delusion. As it is not always easy to state in an early stage how a whitlow may turn out, it is advisable that surgical aid should always be at once obtained.

WHITMAN, a co. in s.e. Washington territory, having the Snake river for its s. boundary; about 3,000 sq.m.; pop., '80, 7,014—5,936 of American birth, 533 colored. Co. seat, Colfax.

WHITMAN, SARAH HELEN (POWER), 1813-78; b. R. I. In 1828 she married John W. Whitman of Boston. She was a literary critic and poet of some merit. *Hours of Life and Other Poems*, a collection of minor pieces, was published in 1853, and *Edgar Poe and his Critics* in 1859.

WHITMAN, WALT, b. West Hills, L. I., 1819; educated in the Brooklyn and New York public schools. He worked at the printer's trade in summer, and was a school-teacher in winter. He traveled extensively in this country and Canada, 1847-48; was an editor for a short period in New Orleans and Long Island, and, finally returning to Brooklyn, learned the carpenter's trade. He was a nurse in the federal military hospitals, 1862-65; and a government clerk at Washington, 1865-74. He now (1881) lives in Camden, N. J. He published in *Leaves of Grass*, a book of poems without rhyme. His other works, of which a complete edition was published in 1876, comprise *Democratic Vistas*; *The Two Rivulets*; and *Drum Taps*. There is much debate regarding his rank as a poet—some critics placing him among the most eminent living poets; others denying him even the name of poet. He has many admirers in England. His style is so undeniably his own that he can be classed with no other writers. Freshness at least cannot be denied as one of its features.

WHITNEY, ADELINE D. (TRAIN), b. Boston, 1824; married Seth D. Whitney of Milton, Mass. Her first published writing was a poem, *Footsteps on the Seas* (1857). She has contributed to several magazines, and is the author of the very popular stories, *Faith Gartney's Girlhood* (1863); *A Summer in Leslie Goldthwaite's Life* (1866); *Patience Strong's Outings* (1868); *Real Folks*; *Odd and Even* (1879); and others.

WHITNEY, ASA, 1791-1874; b. Mass.; in his youth learned the blacksmith's trade, and became a machinist. He was engaged in the manufacture of machinery in several states; in 1830 was made master-machinist, and in 1833 superintendent of the Mohawk and Hudson railroad. From 1839 to 1841 he was a canal commissioner of New York, and in 1842 went into partnership with Matthew Baldwin in the manufacture of locomotives at Philadelphia, where he remained until his death. In 1848 he began the manufacture of patent iron annealed car-wheels, by which he acquired large wealth. He left \$50,000 to the university of Pennsylvania for the founding of a chair of dynamical engineering.

WHITNEY, ELI, American inventor, was b. at Westborough, Mass., Dec. 8, 1765, and was educated at Yale college, where he paid his expenses partly by school teaching, partly by mechanical labor. Having graduated in 1792, he went to Georgia as a teacher; but finding a generous patron in the widow of gen. Greene, of the revolutionary army, he resided on her estate, and studied law. The cotton culture at this period, especially that of the best kind, the "green seed," was limited by the slow and difficult work of separating the cotton from the seed by hand; but Mrs. Greene told her complaining neighbors that she was sure Whitney could help them out of their trouble, for he could make anything. At their desire, he set to work under great disadvantages, for he had to make his own tools, and even draw his own wire; but the reports of his success prompted some lawless people to break into his workshop, and steal his machine, and get others made before he could secure a patent. He, however, formed a partnership with one Miller in 1793, and went to Connecticut to manufacture cotton gins; but the lawsuits in defense of his rights took all his profits, and \$50,000 voted him by the state of South Carolina. Finally in 1798 he got a government contract for the manufacture of fire-arms, and was the first to effect the division of labor, by which each part was made separately. He made a fortune by this manufacture, carried out with ingenious machinery at Whitneyville, Conn.; while he had but barren honor from the gin, one of the most important of the whole series of inventions connected with the cotton manufacture. He died at New Haven, Jan. 8, 1825. See COTTON.

WHITNEY, JOSIAH DWIGHT, b. Mass., 1819; graduated at Yale college in 1839. The next year he was employed on the New Hampshire geological survey. He spent the years 1842-46 in European study, and soon after his return engaged on a survey of the lake Superior mineral region. From 1855 to 1860 he made a geological survey of Iowa, and the lead district in Wisconsin; and in 1860 he became state geologist of California. In 1865 he became Sturgis-Hooper professor of geology at Harvard university. He has published valuable reports of his surveys and other works.

WHITNEY, WILLIAM DWIGHT, LL.D., b. Mass., 1827; graduated in 1845 at Williams college. He afterward studied in Berlin and Tübingen, and is now the foremost of American philologists and grammarians. In 1853 he returned to this country, and in 1854 was made professor of Sanskrit in Yale college. In 1856 he published, with prof. Roth of Berlin, the *Atharva Veda Sanhita*; in 1862 a phonetic grammar on the *Atharva Veda*, with text, notes, and translation; in 1868 twelve lectures on the principles of linguistic science; and in 1869 a German grammar and reader, in common use in the schools and colleges of the country. He has contributed many articles to the *Bibliotheca Sacra*, *New Englander*, *Journal of the Oriental Society*, and other periodicals; and has contributed articles on oriental philology and kindred topics to Appleton's American Cyclopædia. In 1879 prof. Whitney published a Sanskrit grammar of both the classical language and the older dialects.

WHITON, JAMES MORRIS, PH.D., b. Boston, 1823; graduated Yale college, 1853; teacher in high school, Worcester, Mass., 1853-54; rector Hopkins's grammar school, New Haven, Conn., 1854-64; pastor First Congregational church, Lynn, Mass., 1865-69; pastor of North Congregational church, Lynn, 1869-75; principal of Williston seminary, Easthampton, Mass., 1876-78; pastor of First Congregational church, Newark, N. J., 1879. He has published: *Latin and Greek Lessons and Primers*, 5 vols.; *Select Orationes of Lysias*; *Is Eternal Punishment Endless?*; *Essay on the Gospel according to Matthew*; *The Gospel of the Resurrection*.

WHITSTABLE, a long, straggling, maritime village in Kent, on the s. shore of the mouth of the Thames, at the mouth of the Swale, 6 m. n.n.w. of Canterbury, with which it is connected by railway. It is noteworthy chiefly because some of the largest artificial oyster-beds lie off the coast, which are regularly farmed by different companies and proprietors. There are breweries, rope-works, copperas works, and boat-building-yards. Some Roman pottery has been found among the oyster-beds, indicating that probably a Roman station existed here. Pop., '71, 5,481.

WHITSUNDAY, in Scotland, is one of the usual terms for regulating the letting of houses and farms. It was formerly movable, but was fixed by stat. 1690, c. 39, to mean May 15. In many respects, however, local usage overrules the statute; thus, in Edinburgh, the term of entry to a house is May 25.

WHITSUNTIDE ("White-Sunday-tide"), the English name of the season of Pentecost (q. v.), is so called from the white garments anciently worn by the newly baptized catechumens, to whom that sacrament was usually administered on the vigil of Pentecost. The name "Whitsuntide" comprehends the entire octave or the week which follows Pentecost Sunday; but the word is more strictly applied to the Sunday, Monday, and Tuesday of that week. The two latter days, down to a very recent date, were observed in the Roman Catholic church as holidays of strict obligation. Many festive observances were anciently practiced in connection with the Whitsuntide holidays, which in England and other Protestant countries still subsist, having outlived the religious association out of which they originated.

WHITTEMORE, AMOS, 1759-1828; b. Mass.; at first a gunsmith in Cambridge; afterward engaged in the manufacture of wool and cotton cards. In 1797 he secured a

patent for a card-making machine to puncture the leather and set the wires, which was sold for \$150,000, but eventually bought back by his brother Samuel. Whittemore was never able to secure an English patent for his invention.

WHITTEMORE, THOMAS, D.D., 1800-61; b. Boston; studied theology with the rev. Hosea Ballou; minister of a Universalist church at Milford, Mass., 1821, and at Cambridgeport, 1822-31; was associate editor of the *Universalist Magazine*; editor and proprietor of *The Trumpet*, a Universalist paper, for 30 years. He was president of the Massachusetts and Vermont railroad, president of the Cambridge bank, and member of the legislature. He published: *Modern History of Universalism*; *Songs of Zion*; *Life of Hosea Ballou*; *A Plain Guide to Universalism*.

WHITTIER, JOHN GREENLEAF, American author and poet, was b. at Haverhill, Mass., Dec., 1807, in the society of Friends. He worked on a farm and at shoe-making in his boyhood; but at the age of 18, having a strong desire for learning, he studied for two years at a local academy. In 1829 he became editor of the *American Manufacturer*, a paper published at Boston to advocate a protective tariff; in 1830 he was editor of the *New England Review*, at Hartford, Conn., where he wrote a *Life of Brainerd*, and *Legends of New England*. The subjects of these legends he afterward worked out in his poems, as *Moss Megone*, *Bridal of Pennacook*, *Cassandra Southwick*, and *Mary Garvin*. Returning to his farm, he was, in 1835, elected to the Massachusetts legislature; in 1836 appointed secretary of the anti-slavery society, and editor of the *Pennsylvania Freeman* in Philadelphia; in 1840 removed to Amesbury, Mass., as correspondent of the *National Era*. His principal writings are—*Voices of Freedom*, poems collected in 1849; *Leaves from Margaret Smith's Journal*, poems collected in 1849; *Old Portraits and Modern Sketches*, biographical, 1850; *Collected Poems*, 1850; *Songs of Labor*, and other Poems, 1851; *The Chapel of the Hermits*, 1853; *Literary Recreations*, 1854; *The Panorama*, 1856; *Home Ballads*, 1859; *In War Time*, 1863; *National Lyrics*, 2 vols., 1855-56; *Snow-Bound*, and *Maud Miller*, 1836; *The Tent on the Beach*, 1867; *Among the Hills*, 1868; *Ballads of New England*, and *Miriam*, 1870; *The Pennsylvania Pilgrim*, 1872; *Mabel Martin*, 1874; *Hazel Blossoms*, 1875; and a *Centennial Hymn*, 1876. These poems have that rugged picturesqueness and correspondence of sound to sense which secure wide circulation.

WHITTINGHAM, WILLIAM ROLINSON, D.D., 1805-79; b. New York; graduated at the General theological seminary, New York, 1825; ordained, 1827; rector of St. Luke's church, New York, 1831; went to Europe for health, 1834; elected professor of church history in the General theological seminary, 1835; consecrated bishop of Maryland, 1840. During the war of the rebellion he was a firm friend of the national government, while a large majority of his clergy were disloyal. He edited *The Family Visitor*, *Children's Magazine*, *The Churchman*, *Parish Library of Standard Works*, with prefaces, notes, etc., and published several sermons.

WHITTINGTON, RICHARD. As the existence of this remarkable man is by many supposed to be wholly mythical, it has been thought not out of place here to state briefly the few authentic facts of his life. Whittington was descended from a good Gloucestershire family, and was born probably about 1360, the younger son of sir William Whittington, who possessed the estate of Pauntley in that county. His father died not long after Whittington was born, and Richard, who had no fortune, set out for London, to endeavor to make one by means of trade. That he left London on account of ill-usage, but was induced to return by his interpretation of the friendly sound of Bow Bells, and that he afterward made his living through the instrumentality of a cat, are stories not improbable, but which cannot be well authenticated. He appears, however, to have apprenticed himself to a mercer, and to have rapidly risen in the world. It is not known at what date he set up for himself, but we find him a member of the Mercers' company in 1392, in which year he was elected an alderman of the city, and in the following year was appointed sheriff. In 1398 Whittington was elected lord mayor of London; was again chosen to fill that office in 1406; was elected member of parliament for the city in 1416; and in 1419, for the third time, filled the office of mayor. These statements accord with the popular story of Whittington's having been "thrice lord mayor of London," although some antiquaries doubt if he filled that office oftener than twice. Whittington, on account of various services rendered to Henry V., received from that sovereign the honor of knighthood. We are not informed of the date of Whittington's marriage; but from various authentic sources we learn that his wife's name was Alice, daughter of sir Hugh Fitzwarren. She appears to have died several years before her husband, and to have left no issue. Whittington died in the spring of 1423, aged about 63 years. There can be no doubt that Whittington was diligent and exceedingly prosperous in business, upright and liberal in character—"a virtuous and godly man, full of good works (and those famous)"—and in many respects considerably in advance of his time. His liberality appears to have been unbounded. At his death, he left the bulk of his property to be laid out in purposes of charity, and in completing those works which had been commenced under his own superintendence. For further details concerning the life of this remarkable man, we refer the reader to the rev. Samuel Lysons's *Model Merchant of the Middle Ages* (Lond. 1860), an admirable and judicious biography of Whittington; also to various volumes of *Notes and Queries*.

WHITTLESEY, or **WHITTLESEA**, a decaying village and market-t. in Cambridgeshire, 5 m. e. of Peterborough. The population in and about Whittlesey are mostly employed in agricultural pursuits and in brickmaking. *Whittlesea-mere*, a shallow lake, which formerly existed in the n. of Huntingdonshire, 4 m. s.w. of Whittlesey, was 2 m. in length by 1 in breadth, and abounded in fish, water-fowl, etc., is now drained and laid out in fenlands, which are under cultivation. Whittlesey is connected by a branch with the Great Northern and Great Eastern railways. The pop. in '71 was 4,297.

WHITTREDGE, **WORTHINGTON**, b. Ohio, 1820; became a portrait and landscape painter in Cincinnati. After a residence in Europe, 1849-59, he took up his residence in New York. Among his best-known works are: "Lake George," "Ruins of Tusculum," "The Roman Campagna," and "The Coast of Rhode Island."

WHITWORTH, **SIR JOSEPH**, b. England, 1803; studied mechanics and manufacturing in Manchester, and became a large manufacturer. He made valuable inventions in planing machines, etc.; but is best known as the inventor and manufacturer of the Whitworth breech-loading cannons and rifles, which he began to make in 1854. His baronetcy was bestowed on him in 1869. See **ARTILLERY**.

WHOOPIING-COUGH. See **HOOPING-COUGH**, *ante*.

WHORTLEBERRY. See **HUCKLEBERRY**, *ante*.

WHY DAW, or **WHIDAW**, a maritime province of Dahomey (q.v.), on the bight of Benin. It is populous and very fertile, and exports palm-oil, gold-dust, ivory, and many slaves.—The town of Whydaw is the principal seaport of Dahomey, a decaying place, owing to the suppression of the slave-trade. It is still, however, the principal seaport of the kingdom. Pop. formerly 50,000, now under 12,000. It is situated about a mile and a half from the sea, close to a lagoon and a swamp, between which and the sea a sandy neck intervenes. Into the lagoon flow several rivers, known to slave-traders.

WHYDAW BIRD, **WHYDAW FINCH**, or **WIDOW BIRD**, *Vidua*, a genus of birds of the family of weaver-birds (q.v.), having long wings, and a boat-shaped tail, the two middle feathers of the tail of the males excessively lengthened during the breeding-season. The name is derived from the country of Whydaw in western Africa, and widow bird is a mere corruption of it, which, however, has given to the genus its name *vidua* (Lat. widow), regarded as appropriate, because the long tail of the male drops off after the breeding season, and also because of the general dark color of the plumage. The species are natives of the tropical parts of Africa and the s.e. of Asia. They are frequently brought to Britain as cage-birds, both on account of their plumage and the sweetness of their song. The best-known species (*V. paradisica*) is a small bird, about the size of a canary, with black and brownish-black plumage, with a broad collar of orange-rufous color, and breast of somewhat similar color; two feathers of the tail in the male very broadly webbed in the breeding season, and ending in a hair-like shaft, two feathers very much elongated, sometimes a foot in length, and about three-quarters of an inch in breadth.

WHYMPER, **EDWARD**, b. London, 1840; at first a draughtsman on wood. Preferring an active life, in 1864 he went up Mont-Pelvoux, then thought to be the highest mountain in France, and from its top discovered the Pointe des Ecrins, the highest of the French Alps and ascended by Whymper in 1864. The next year he succeeded in making the ascent of the Matterhorn (14,780 ft. high), though three of his companions and one of his guides were killed. He has since made the ascent of Chimborazo.

WICHERN, **JOH. HEINRICH**, superintendent of the Rauhes Haus (q.v.), near Hamburg, and known by his exertions in the affairs of the German home mission, was born at Hamburg on April 21, 1808. He attended the gymnasium of his native town, and then studied theology at Göttingen and Berlin. Shortly after passing his examinations at Hamburg, he directed himself to practical usefulness, visited the poor and the wretched in the courts and lanes of the town, and undertook the direction of a free Sunday-school for poor children, in which he soon gathered round him from 400 to 500 scholars, instructed by 40 voluntary male and female teachers. At this time Wichern declined the offer of a charge in the neighborhood of Hamburg, as he already entertained the idea of an institution such as the Rauhes Haus, which he opened in 1833. From about 1840 Wichern was much engaged with undertakings of a similar kind in Germany, to which his mother institution gave rise. The example was soon followed by France on a great scale (Mettray, near Tours), then by England, Holland, and other countries. It was chiefly through the instigation of Wichern that at the first Protestant ecclesiastical assembly held at Wittenberg in 1848, for the purpose of concerting united action, a central home mission committee was appointed, under which title Wichern had formed the idea of comprehending all exertions on behalf of the poor, the miserable, and the morally and religiously lost. This home mission has exerted a wide and beneficial influence on the n. of Germany, and as a member of the committee, Wichern found in it an extended field for his exertions. Traveling through all parts of Germany, Wichern was the means, by his exhortations, of founding all sorts of institutions and societies for education and the care of the sick, of the poor, and of prisoners. On his return from a visit to England in 1851, the Prussian government commissioned him to inspect all the houses of correction and prisons, to the general supervision of which he

was appointed in 1858. Prevented by this constant practical usefulness, he has published but little. In his *Home Mission of the German Evangelical Church* (Hamburg, 1849), he explains his views of Christian charity, and its relation to the ecclesiastical and social questions of the day. Since 1844 he has published his *Fliegende Blätter* (Fugitive Leaves), which contain parts of his discourses at the ecclesiastical diets. In 1851 Wichern received from the university of Halle the degree of D.D.

WICHITA, a co. in w. Kansas, drained by the branches of Smoky Hill river; 720 sq.m.; pop. '80, 14—13 of American birth.

WICHITA, a co. in n. Texas, having the Red river for its n. boundary, drained by the Wichita river; 650 sq.m., pop. '80, 433—418 of American birth, 17 colored.

WICK, a royal, parliamentary, and municipal burgh and sea port, capital of Caithness-shire, stands on both sides of Wick Water, at the mouth of that stream, and at the head of an inlet called Wick bay, 16 m. s.s.w. of Duncauby head, and 20 m. e.s.e. of Thurso. The parliamentary boundaries include the royal burgh, containing (1871) 1767 inhabitants, which, with the suburbs of Louisburgh and Boathaven, containing 1000 more, lies on the n. side of the river and bay, and Pulteney town on the s. side; pop. over 5,000—the total pop. of the parliamentary burgh being, in '71, 8,145. Pulteney-town, a settlement of the British fisheries society, is a flourishing town managed by improvement commissioners. The bay is about a mile long by half a mile broad, exposed to frequent storms from e. and n.e. There is an excellent tidal harbor of considerable capacity, the property of the said society. The society some years ago undertook the construction of a breakwater in deep water, and spent large sums upon it. Considerable progress was made with the work, but a series of storms destroyed the greater part of it, and the completion of it seems now to be abandoned. The institutions within the parliamentary burgh comprise a county court-house and prison, 9 churches and chapels, a town-hall, the Pulteney-town academy, and a chamber of commerce. There are 2 weekly newspapers. Wick is the great center of the herring-fishing in Scotland, though of late years the take has not been so great as it had formerly been. Everything in the town is subservient to the herring-fishery, and the trades—chiefly barrel-making, boat-building, and rope-making—are directly supported by it. A railway connecting Wick with the s. was opened in 1874. In 1877 the number of herring-boats was 846, and the number of barrels salted was 60,684. In the same year 920 vessels, of 98,413 tons, entered, and 904 of 88,190 cleared the port.

WICK, the material used for the center of candles and lamps, which, from its porous nature, draws up the oil by capillary attraction in such quantities as to burn easily. Usually, wicks are made of cotton, but formerly flax, hemp, and rushes were used. For ordinary candles the wick consists of a bundle of cotton thread, lying parallel with each other, but for wax, spermaceti, paraffine, stearine, etc., they are usually of twisted or plaited cotton. Very ingenious contrivances have been applied to the manufacture of candle-wicks, to prevent the necessity of snuffing. See CANDLE.

WICKLOW, a maritime co. of the province of Leinster, Ireland, is bounded on the n. by the co. of Dublin, e. by the Irish channel, s. by the co. of Wexford, and w. and s.w. by the counties of Carlow and Kildare. Its greatest length is 40 m., and greatest breadth 33; the total area being 781 sq.m., or 500,178 acres, of which 118,000 are under tillage, 249,200 pasture, 19,500 in plantations, 112,300 towns, waste, etc., and 1090 under water. The pop. in 1851 was 92,978; and in 1871, 78,697, of whom 63,392 were Roman Catholics, 13,963 Protestant Episcopalians, and the rest Protestants of other denominations. The coast-line stretches in a southerly direction about 39 m., is in many parts precipitous, and being, moreover, obstructed by sandbanks, is very dangerous for shipping. The surface ascends in some parts most abruptly from the sea, and a large portion is mountainous and unproductive. The Wicklow mountains, however, form rather a group than a range, and on the western and north-western side, decline less precipitously toward the central plain. The most elevated point is Lugnaquilla, which is 3,039 ft. above the level of the sea. Several other peaks approach this elevation, and the glens which lie between the several mountains or groups are exceedingly picturesque, especially Glendalough, Glendalure, Imail, the Glen of the Downs, and Avoca, the scene of Moore's well-known Irish melody, *The Meeting of the Waters*. The valleys are, for the most part, of limited extent; but some plains of considerable size lie upon the eastern and southern shore. The lakes, although strikingly beautiful, are few in number, and of small size; and the rivers, some of which drain the eastern, and others the western slope, are little more than mountain streams, at least so far as their course lies within the limits of this county. The Liffey and Slaney rise in Wicklow, but do not reach any considerable volume until after they have issued from it. The great central group of mountains is a mass of granite, which protrudes through mica and clay slate, to which latter formation the minor elevations both on the eastern and the western side generally belong. The granitic protrusion, which is one of the most remarkable and best defined in the kingdom, falls away on the e. side toward the sea, and on the w., toward the great central limestone. The minerals of Wicklow are numerous and varied in character. In the granite and mica-slate are found galena, green and white lead ore, and copper pyrites. From the clay-slate tract are obtained gold, silver, copper, iron, lead, zinc, tin, tungsten,

manganese, arsenic, and antimony. The quantity of gold found is very small. Silver is found in combination with lead, which is raised with great success and profit at Glenmalur. The copper mines also are very productive; and of late years, the utilization of the sulphur, which was formerly wasted, has added largely to the profit of the mining operations.

The climate resembles that of Wexford (q.v.). The soil is very various in character. In the mountains, it is thin and poor, but generally dry, although there is a considerable proportion of bog. In the valleys and level districts, the subsoil is generally gravel, and the soil is for the most part either dry, or, even in the boggy districts, susceptible of drainage. On the whole, in the lowlands, the soil is moderately fertile; but there is little cultivation of wheat, the chief agricultural pursuits being dairy-farming and grazing; and the culture, on a limited scale, of barley, oats, turnips, and potatoes. In 1878 the acreage under crops was 110,932, of which more than one-half—viz., 61,033—was under meadow and clover; and 24,770 were under oats. In 1878 the number of cattle was 77,804; sheep (of which a small breed prevails in this county), 199,452; horses, 12,183; and pigs, 24,555. Throughout the greater part of the county, the occupations of the people are purely agricultural. The fisheries are almost wholly neglected; and the manufacture of flannels, once extensive, is now nearly extinct. The total annual value of property in Wicklow, under the valuation act, was £272,380 in 1874. There is a large number of villas, with extensive and highly cultivated parks, especially in the picturesque district which lies between Bray and Wicklow. The county is divided into eight baronies. The principal towns are Wicklow (q.v.), the capital, Arklow, Baltinglass, Shillelagh, Rathdrum, Bray, and Newtown-Mount-Kennedy. Wicklow returns two members to the imperial parliament. The schools, in 1872, numbered 57, with 12,216 pupils. Wicklow is described by Ptolemy as the territory of the *Cauci*, and the names of the rivers mentioned by him are still traceable in their modern appellations. At the invasion, the greater part of the lands of Wicklow were granted to Maurice Fitzgerald, and Wicklow was included by John in the shire of Dublin. Generally speaking, however, the authority of the English in Wicklow was little more than nominal; the territory being under the command of the chief of the O'Byrne. A vigorous effort was made by the lord-deputy, sir Arthur Chichester, to establish the king's authority in Wicklow, and in 1605 it was erected into a separate county; but again, in 1641, the population joined in the general uprising. From the date of the settlement, however, they were effectually held in subjection. During the rebellion of 1793 Wicklow was the scene of more than one conflict, and the peasantry, in some districts, suffered severely from the vindictive character of the repressive measures adopted by the ascendant party.

Wicklow abounds with antiquities of the highest interest. Many tumuli, raths, cromlechs, and other Celtic remains are preserved; and there are very many ecclesiastical remains of almost every period of Irish Christian architecture; those of Glendalough, which include a round tower, are especially interesting.

WICKLOW, a sea-port, capital of the above co., is situated at the mouth of the river Vartry, n. lat. 52° 58', w. long. 6° 3', 32 m. s.e. from Dublin, with which city it is connected by the Wicklow, Wexford, and Waterford railway. The pop. in 1871 was 3,164, of whom 2,433 were Catholics, 613 Protestant Episcopalians, and the rest of other denominations. It is an assize town, the smallest in Ireland. The municipality is administered by 21 town commissioners; but although it is a sea-port the export trade is extremely small; nor are the fisheries of much value. The principal exports are the products of the mining operations and the agricultural produce of the district. The streets are narrow and ill built, nor is there any public building deserving of notice.

WICOMICO, a co. in s.e. Maryland, having the Pocomoke river for its e. boundary, the Nanticoke on the n.w., Chesapeake bay on the s.w., drained by the Wicomico; 400 sq.m.; pop. '80, 18,016—17,986 of American birth, 5,073 colored. Co. seat, Salisbury.

WICOPY. See *LEATHERWOOD*, *ante*.

WIDDIN, or **VIDIN**, formerly an important Turkish fortress, is now a t. in the recently constituted principality of Bulgaria, on the right bank of the Danube, 140 m. from Belgrade, and is surrounded on the land side by morasses. Its streets and bazaars are pestiferously dirty. For centuries, Widdin has been a strong post in all the contests between the Turks and their northern neighbors, and it was called by the Turks the Virgin fort, from its never having been taken. Widdin has thriving industries and trade. The Berlin congress of 1878, which erected Bulgaria into a principality, determined that the extensive fortifications of Widdin and other Bulgarian fortresses should be demolished. Pop. about 25,000.

WIDGEON, or **WIGEON**, *Marca*, a genus of ducks of the non-oceanic section, with the hind-toe not webbed, having the bill shorter than the head, and of equal width throughout, much rounded at the tip, with a broad strong nail; the lamellæ of the upper mandible prominent; the wings long and pointed; the tail wedge-shaped. The species are pretty numerous, migratory birds, appearing in great flocks in the warmer countries which they visit during the winter. The COMMON WIDGEON (*anas* or *marcca penelope*) is plentiful in Britain during winter. A few breed in the most northern parts of Scotland, but the ordinary breeding-place is in more northern regions. This species is

found at some season of the year in almost all parts of Europe, and in Asia as far s. as the n. of India. It is found also in North America, along the Atlantic coast. It is known as one of the birds of Japan. Its whole length is about 18 inches. The forehead and top of the head in the male are white, the cheeks and hind-part of the neck reddish chestnut; the upper parts grayish white, crossed with irregular zigzag lines of black; the tail nearly black; the wing coverts white, tipped with black; the primaries dark brown; a green speculum edged with black; the throat, pale rufous; the breast and belly, white. The female is very different, the head and neck rufous brown, speckled with dark brown; the back varied with two shades of brown, darker in the center, and paler in the edges of the feathers. The widgeon is the most common of all the duck tribe in Lapland, frequenting grassy swamps, lakes, and rivers. Flocks of widgeon appear in Scotland and England, on lakes and rivers, in winter, and most abundantly in severe winters. They feed during the day time, and chiefly on grass. The note of the Widgeon is a shrill whistle, whence its French name *siffleur*, and the English names, *whew duck* and *whewer*. Its flesh is good for the table.—The AMERICAN WIDGEON (*anas or mareca Americana*) is a larger bird than the European widgeon, being about 22 in. long. The upper parts are finely waved transversely with black and reddish-brown, the under parts are mostly white; the top of the head is almost white; the wing-coverts white, the greater tipped with black; the speculum green, encircled by black. It breeds chiefly in the northern parts of America, and is common in winter on the coasts of the United States, and in the rice-grounds. Its flesh is highly esteemed. It is known as an occasional, but very rare visitant, in the British Islands.

WIDOW (see *JUS RELICTÆ, SUCCESSION, MARRIAGE*). A widow's right to dower, by the common law of England, extends to a life estate in one-third of the lands and tenements of which her husband died seized, and which any issue she may have had might by possibility have inherited. The law of dower was considerably altered by a statute 3 and 4 Will. IV. c. 105; and in cases where married parties are entitled to real property, their rights are generally regulated by contract. There are certain modes of conveying and devising property so as to prevent dower arising, and a widow's right to dower is also generally prevented by giving her a jointure. A woman loses her dower by a divorce, but not by judicial separation or other misconduct.

WIDOW-BIRD. See *WHYDAW BIRD, ante*.

WIELAND, CHRISTOPH MARTIN, one of the greatest of German poets, was born, Sept. 5, 1733, at Oberholzheim, near Biberach, his father being pastor of that place and afterward in Biberach itself. The precocity of his powers early excited attention, and when only 12 years of age, he had essayed his poetical talent both in Latin and in German verses. In 1750 Wieland went to the university of Tübingen to study law, but occupied himself more with the classics, and with recent literature both native and foreign. From Tübingen, he returned to Biberach in 1752. At this time, Klopstock's example had an extraordinary influence on him, so that he gave himself up to a mystical piety, foreign to his nature, which he gives utterance to in the *Empfindungen des Christen* (The Christian's Experiences). While in this mood, an invitation from Bodmer led him to give up the intention of graduating at Göttingen, and go to Zürich. The number and nature of his production at this time show the effect which the example of Bodmer's desultory way of working was beginning to have upon him. He soon, however, returned to the more congenial field of the literature and life of the Greeks. The lively interest which he took in Frederick the great prompted Wieland to work out the ideal of a hero in a great poem, for which purpose he fixed on Cyrus. The first five cantos appeared, 1757, and a new edition, 1759; but the reception it met with was not very cordial, and consequently it remained unfinished. The beautiful episode from the *Cyropaideia* of Xenophon, *Araspes und Panthea*, appeared about this time, and revealed Wieland as the poet of love. In 1760 he received an appointment in his native town in connection with the law-courts. At this period he engaged in the arduous task of translating Shakespeare (8 vols. Zür. 1762-66). However little Wieland, whose mind had been formed after Greek, Roman, and French models, and who was constitutionally inclined to pleasant and easy trifling, was calculated to enter fully into the spirit of Shakespeare, he nevertheless was, for his time, tolerably successful, and opened up the path for his successors.

Wieland now spent much of his time at Warthausen, near Biberach, the estate of the count von Stadion, an accomplished and highly intellectual man, but thoroughly a man of the world, and averse to all religious enthusiasm. From the tone of the society he met here, as well as by the course of his reading, Wieland became imbued with that modern French philosophy which runs through the most of his later writings. In some of these, there is an unmistakable tendency to licentiousness, from which his personal life always remained free; in most of them, however, he has blended the Greek sensibility to outward impressions with the French love of pleasure into a peculiar graceful philosophy of life. The first production which bears the impress of this French-Greek sensuousness, was the poetical tale *Nadine*, which he himself calls a creation in Prior's manner. In 1766 and 1767, *Agathon*, a romance in 3 vols., made its appearance, which greatly contributed to establish Wieland's fame. His views on the subject of love are most fully and worthily expounded in the didactic poem *Musarion* (1768), a work of

singular grace and harmony of treatment, which he himself called a philosophy of the Graces. Wieland had, in the meanwhile (1765), married a lady of Augsburg, and accepted a call to Erfurt (1769), as professor of philosophy in the university. He terminated what may be called the erotic period of his literary career with the *Verklagter Amor* (The Impeachment of Love), wherein he, in a manner, vindicated the kind of poetry to which he had till then devoted himself.

A period of delightful leisure and undisturbed work began for Wieland when the widowed duchess Anna Amalie invited him to Weimar (1772), as tutor to her two sons, with the status of hofrath, and a salary of 1000 thalers, which was continued to him after his duties as tutor ceased. Wieland was entirely in his own place in the society of the distinguished men (such as Musäus and Von Einsiedel) already gathered round this court; and his genius began to soar more courageously. He wrote his vaudeville *Die Wahl des Hercules* (The Choice of Hercules), and the lyrical drama, *Alceste* (1773), which were received with great approbation. Of greater importance for German literature was the publication of the *German Mercury*, a monthly periodical, to which Wieland, till toward the close of his life, devoted himself with the greatest earnestness, and which he made the vehicle for disseminating his æsthetic views. On the whole, however, his criticism was neither genuine nor very deep, and suffered from that conventional narrowness which was then dominant in France. His letters on his *Alceste* in the *Mercury* (Sept., 1773) contains sufficient traces of this tendency, at which Goethe and Herder were so much offended. The former wrote in relation to it the satire *Götter, Helden, und Wieland* (Gods, Heroes, and Wieland). Wieland answered the attack with pleasantry and with his characteristic good nature. Shortly afterward, Goethe himself joined the circle at Weimar, the soul of which was the duchess-mother, Anna Amalie. Wieland's literary powers developed themselves here more and more; and for more than 20 years, almost nothing of any importance occurred, either in the political or literary world, in which he did not take a more or less active part. His literary productiveness showed itself chiefly in the *Geschichte der Abderiten* (History of the Abderites, 1773), a charming work, depicting the follies of small communities, in which the muse of Wisdom is disguised under the garb of the Satyr. This was followed by a series of tales and stories, partly imitations of foreign originals, and partly of his own invention. *Oberon*, a romantic heroic poem, the most perfect and enduring of his greater works, appeared 1780 (last ed. Leip. 1833). It was followed by the translation of Horace (*Letters*, 1782; *Satires*, 1786) and of Lucian (1788). Wieland pronounced the *Epistles* of Horace with the commentaries to be those of his works on which he put the greatest value. He has given us a complete sketch of his conception of the Greek world in the *Aristippe* (1800). A collected edition of Wieland's works up to 1802, in 36 vols., with 6 supplementary vols. in large quarto, and large and small octavo (new edition with the poet's life, 53 vols., 1828; 36 vols., 1839), was got up by the bookseller Götschen in Leipzig. From the proceeds, Wieland was enabled to buy the estate of Osmannstätt, near Weimar. From 1798 to 1803, he lived here in the circle of his numerous family (his wife, in the course of 20 years, had brought him 14 children), and devoted the greatest part of his time to literary labors, among which his *Attic Museum* (1796-1804) and the *Neue Attic Museum* (1805-9) were not the least. In these publications, he strove to make his countrymen familiar with Greek poetry, philosophy, and rhetoric. In 1803 he sold his estate, and returned to Weimar, where he very soon became intimate with Schiller. Here he lived to see the day of the battle of Jena, the death of the duchess Amalie, and also of Herder and Schiller. The marks of honor which he received from Alexander and Napoleon, and his admission to the French "Institut," helped to alleviate his many griefs, among which one of the greatest was the death of his wife, 1801, with whom he had lived for so many years in great happiness. His own death took place Jan. 20, 1813.

Wieland had neither the spirit of a reformer like Klopstock and Lessing, nor did he attain the poetical greatness of Goethe or Schiller; nevertheless, he did great service to German literature, which has not always been sufficiently recognized. He gave to German poetry, as it was rising into true national importance, the still wanting grace and harmony of expression and versification, in which respect Goethe learned much from him. The poetic handling of mediæval chivalry was an entirely new creation of his, and thus the school of romantic poetry is indebted to him for its origin. He also introduced poetical materials from England, France, Spain, and Italy, which were not without influence. In all his appropriations Wieland exercised that fine discernment which seizes upon what is universally human, so that he nowhere appears as a blind imitator. His criticism, too, with all its shallowness, contributed much to the diffusion of general culture.—Compare, besides Gruber's *Biographie Wieland's* (4 vols., Leip. 1827; vols. 50-53 of the *Works*), *Wieland's ausgerühmt Briefe* (4 vols., Zür. 1815), *Auswahl denkwürdiger Briefe* (2 vols., Wien, 1815), and *Briefe an Sophie Laroche* (Berl. 1820); also Löbell's *C. F. Wieland* (1858).

WIELICZKA, a small t. of Austrian Galicia, 10 m. directly e.s.e. of Cracow, and the same by railway. It is remarkable for its salt-mines, in which the majority of its inhabitants (4,945 in number in 1869) are employed. The mines were discovered in 1250, and have been continuously worked since that time; though some assert that there is abundant evidence to prove that they have been worked since the 9th century. The

town itself is entirely undermined by the excavations, which extend upward of 9,590 ft. from e. to w., 3,600 ft. from n. to s., and are 1780 ft. in depth. The mines extend to four stories or "fields," one below the other. In the second story, the visitor is rowed across a salt lake, and when he has reached and is exploring the third story, he is informed that the lake he lately crossed is now right above his head. The stories are simply large chambers excavated in one enormous mass of rock-salt, of great purity, and apparently of inexhaustible extent. In one of the chambers, the miners have scooped out a Gothic chapel, and skillfully carved a number of statues and obelisks from the solid rock-salt. The mines produce 61,500 tons English per annum.

WIENAWSKI, HENRI, 1835-80; b. Poland; educated at the Paris conservatory, where he was a pupil of Clavel and Massart on the violin; and afterward studied harmony with Colet. He began to give concerts in 1852, and soon won a high reputation as a violinist. He visited the United States with Rubinstein in 1872. He subsequently became a professor in the Brussels conservatory. He has written many compositions for the violin.

WIESBADEN, chief t. in the Prussian district of the same name, in the province of Hesse-Nassau (formerly the independent duchy of Nassau), one of the oldest and most famous of the German watering-places, delightfully situated on the s. slopes of Mt. Taunus, 26 m. w. of Frankfort, and 5 m. n.w. of Mainz by railway. The town has been called "a city of loding-houses," and this may be understood from the fact that during the "season" the number of the visitors is greater than that of the resident inhabitants. But though almost every house is appropriated to the reception or entertainment of guests, the town is well and regularly built. The *kursaal* comprises an extensive dining-hall, in which frequently 300 people sit down to dinner, and which also serves as a ball-room, together with good reading-rooms, etc. In the large gardens behind the *kursaal*, it is the habit of the visitors to sit in the evenings at their numerous small tables, regaling themselves with coffee or ices—the men smoking, the women knitting—and all either chatting or listening to the music played by a band on such occasions. Other buildings are the *schlösschen* (little palace), containing a library of 60,000 vols., and a collection of antiquities, in which are a number of curious Roman *bass-reliefs*, statues, altars, etc., found in the vicinity; the handsome Protestant church, finished in 1860; the superb Greek chapel, built by the duke of Nassau as a mausoleum, in which repose the remains of his first wife. There are 14 hot springs, all of a high temperature, and numerous bathing-houses throughout the town; but the principal is the *kochbrunnen*, (boiling-spring), the temperature of which is 156° Fahr. The spring has all the appearance of a boiling caldron, and so copiously does it pour forth its waters, that, though they are used both for drinking and to supply the principal baths in the town, a vast quantity escapes, and runs away through gutters and drains, sending up clouds of vapor in its passage along the streets, and adding to the warmth of the temperature of Wiesbaden in summer. Next in heat and volume to the *kochbrunnen* is the spring that rises in the garden of the *Adler* (Eagle) hotel, the temperature of which is 134° Fahr. The use of the Wiesbaden hot-springs is considered highly efficacious in cases of gout, rheumatism, scrofula, and other skin diseases and nervous affections. The waters of these springs are saline, and contain silica and iron. The prosperity of Wiesbaden is entirely due to its springs; and the beauty of its situation and environment, the agreeable walks and rides, and the never-failing gaiety that prevails during the season, render it one of the most popular of the spas. The season lasts from June to September, and, though the public gaming-tables were abolished in 1872, the number of visitors annually is near 40,000. Pop. '75, 43,674.

Wiesbaden is very ancient; its springs are the the *Fontes Mattiaci* mentioned by Pliny. The Romans built a station here, and erected a fort on a hill on the n.w. side of the town, still known as the Römerberg, and which was garrisoned by the 22d Roman legion. The *Mattiaci*, a subdivision of the German tribe called the *Cutti*, allied themselves with the Romans; but in the 3d c. the barbarian Germans rose against the Romans, and destroyed their forts, including Wiesbaden. Urns, tiles, coins, etc. are found abundantly whenever the foundation of a house is dug; and that the Romans appreciated the virtues of the waters is proved by the remains of ancient baths that have been found, and by the votive tablets recording the thanks of Romans who had been restored to health by the waters, still preserved in the museum.

WIERTZ, ANTOINE JOSEPH, 1806-65; b. Belgium; studied art in Antwerp and at Rome, returning to Brussels in 1865. In the earlier part of his career Wiertz produced several pictures biblical or mythological in subject, and of colossal size, such as "Contending for the Body of Patroclus" and "The Triumph of Christ." He was a man of undoubted genius, though eccentric and with a strong taste for the grotesque. On one occasion he sent a genuine Rubens to a Paris exhibition marked with his own initials. It was promptly rejected, and he did not fail to turn the rejection into ridicule. His studio, built for him in 1847 by the Belgium government, is still open to the public, and contains all his paintings, many being specimens of the *peinture morte*, a combination of fresco and oil painting by which many startling effects are produced.

WIESELBURG, a co. in w. Hungary, drained by the Danube, Rabnitz, and Leitha rivers; 750 sq.m.; pop. '70, 75,846. Capital, Ungarisch-Altenburg.

WIG (Lat. *pilus*, the hair; *pilare*, to pluck off the hair; from which was formed *piluccare*, and hence *pilucca*, a head of hair; this was transformed in Ital. into *perrucca*, Fr. *perruque*, whence Eng. *perwig*, shortened into *wig*). The use of false hair for concealing baldness, or for the supposed adornment of the head, appears to belong to all ages and countries. There is an Egyptian wig in the British museum, supposed to be about 4,000 years old; and some of the South sea islanders are said to be skillful wig-makers. Xenophon mentions that Astyages wore an immense wig. Several of the Roman emperors wore wigs, and Lampridius relates that the wig of the emperor Commodus was highly perfumed, and sprinkled with gold dust. After this there are no historical traces of the wig till about the end of the 14th c., when wigs made their appearance in France, and hence spread gradually over other European countries. The fashion of wearing wigs set in strong in the reign of Louis XIII. (1610-43), and for more than a century no gentleman of fashion could appear without one. Such was the extravagance in this article of dress that as much as three guineas an ounce was paid in England for fine qualities of hair, and wigs were made at a cost of £140. It was only toward the end of the 18th c. that the unnaturalness of this ornament appears to have been thought of, and it began to be superseded by the queue with hair-powder (q.v.). Except by judges and barristers, wigs are now used only in cases of baldness, and then they are made in imitation of nature, which was by no means the case with the wigs of old times.

WIG'AN, a prosperous market and manufacturing t., and municipal and parliamentary borough, in Lancashire, on the Douglas, 15½ m. s.e. of Preston, and about the same distance from Liverpool on the s.w., and Manchester on the s.e. Originally rather irregularly built, Wigan has for some years progressed rapidly in the improvement of its streets and buildings. It is well sewered and liberally supplied with water. The parish church of All Saints is an ancient stately edifice, and has recently been almost entirely rebuilt. There are 21 churches and chapels belonging to the establishment; 9 Roman Catholic, and 21 other dissenting places of worship. Wigan stands in a coal-field, where canal coal abounds. Cotton-spinning, the manufacture of calicoes and other cotton goods, checks, and home-made linens are extensively carried on. There are also brass and iron foundries, factories for edge-tools, chemical-works, paper-works, and corn-mills. The river Douglas, and the Leeds and Liverpool canal, afford facilities for inland navigation. Pop. '71, 39,110.

WIGGLESWORTH, EDWARD, 1742-1826; b. Mass.; grandson of Michael, and graduate of Harvard in 1761. He received a colonel's commission from the provincial congress of Massachusetts in 1776; and the same year held an important command in Arnold's lake Champlain squadron. He was col. of the 13th Massachusetts regiment, 1776-79. Washington appointed him collector of Newburyport.

WIGGLESWORTH, MICHAEL, 1631-1715; b. England; came with his father to America, 1638; graduated, Harvard college, 1651; tutor and fellow; studied divinity; minister at Malden, Mass., 1656, remaining till his death. He declined the presidency of Harvard college, 1684. He published a poem—*The day of Doom, or a Poetical Description of the Great and Last Judgment, with a Short Discourse about Eternity*—very popular, passing through several editions; *Meat out of the Eater*, another popular poem. He left in MS. a poem on *God's Controversy with New England*, now printed in the *Proceedings of Massachusetts historical society*.

WIGHT, MOSES, b. Boston, 1827; studied painting in Italy, after his return from which he practiced his profession in Boston. He afterward studied *genre* painting at Paris with Couture. Among his portraits are "Agassiz" and "Everett," among his *genre* pictures are "Lisette" and "The Old Cuirassier."

WIGHT, ISLE or, an island in the English channel, remarkable for the variety and beauty of its scenery, and the mildness and salubrity of its climate, lies almost centrally, close off the southern coast of England, in which it is partially embayed, and is divided from it by a channel varying from less than 1 m. to more than 6 m. in breadth, known as the Solent (q.v.), which spreads out to the e. into the broad and safe anchorage of Spithead (q.v.) and St. Helen's roads. Its form is remarkably regular, its longer and shorter diameters (22 m. 5 furlongs, and 13¼ m. in length respectively) running almost due e. and w., and n. and south. Its shape is rhomboidal, and has been compared to a bird with expanded wings or to a turbot. It is 56 m. in circuit, and embraces an area, including its inlets, of 98,320 acres. Pop. '71, 66,165. Newport, which returns one member to parliament, the island returning one, is the capital; the other chief towns are Ryde, Cowes, and Ventnor (all described under their separate headings), of which the first and last have sprung up from small villages within the present century. Yarmouth is a small decayed t. near the western extremity of the island, formerly returning two members, a privilege once also possessed by Newtown on the n.w. coast, a once important town, now sunk to an insignificant hamlet. On the s.e. coast, the delightful health-resorts of Sandown and Shanklin have lately acquired the size and importance of towns. Railway communication has been opened between Ryde and Ventnor, and between Cowes and Newport. Throughout the island there are good though generally narrow roads, for the most part picturesque and bounded by hedgerows. The chief physical feature of the island, to which it owes its shape and much of its beauty, is a

long undulating range of chalk downs, extending, as a kind of backbone, from the Culver cliffs on the e. to the Needles on the w., rising to its greatest elevation in Mottiston down, 661 ft. (Ashley down is 424 ft., and Bembridge down 355 ft.) above the sea. The river Medina, rising near the southern extremity of the island, flows n. through a gap in this range, expands into a tidal estuary below Newport, and flows into the Solent at Cowes, and divides the island into the hundreds of the e. and w. Medina. In addition to the central ridge, a second range of chalk downs, of greater elevation—St. Boniface down, 783 ft., Dunnose (Shanklin down), 771 ft., St. Catherine's, 769 ft.—rises at the southern point of the island, and expands into a broad promontory, the s. face of which forms the picturesque district known as the Undercliff, or "back of the island," of which Ventnor is the capital. This district owes its remarkable beauty to a series of land-slips on a gigantic scale, of prehistoric date, which have laid bare a long wall of rugged cliff, below which a succession of sunny terraces, due to the gradual subsidence of the strata, slope gently down to the sea. The whole of this part of the island is completely sheltered from the colder winds, and enjoys a well-merited reputation as a residence for invalids suffering from consumption or any disease of the respiratory organs. Its remarkable healthiness is attested by the returns of the registrar-general, which prove that the death-rate of the district is absolutely the lowest in the kingdom; while the mildness of its climate is evidenced by the luxuriance of the myrtles, fuchsias, sweet-scented verbenas, and other exotics, which live through the winter without protection.

In a geological point of view, the isle of Wight is most interesting. The great variety of strata displayed within so small an area, under circumstances so favorable for examination, renders it one of the best available localities for the young observer. The n. side of the island presents a succession of tertiary or eocene strata, including beds of fresh-water limestone, which have been extensively worked for building-stone for many centuries, and based on beds of London and plastic clay. In Alum bay, at the w. extremity of the island, the rapid succession of vertical layers of sand and clays of bright and varied hues, produce a singular and beautiful effect. The central ridge or backbone consists of strata of chalk imbedding layers of flints, and the underlying formation in an almost vertical position. Isolated masses of chalk that, in consequence of their superior hardness, have survived the marine and atmospheric waste, form the well-known Needles, at the w. opening of the Solent, and the picturesque rocks of Fresh-water bay. The downs at the s. of the island belong to the same formation, but here the strata have been undisturbed, and are nearly horizontal. The cliffs of the Undercliff are of the upper green-sand or firestone, underlying the chalk. Below this comes the gault or blue marl. To the action of the land-springs upon this unctuous formation, the land-slips to which the back of the island owes its beauty are due. The lower green-sand succeeds the gault, occupying the greater part of the area between the n. and s. chalk downs. This forms excellent corn-land, and presents a wall of cliff to the sea, diversified with many narrow picturesque gorges, locally known as chines, where a small rivulet has eaten away the friable strata. The chief of these are those of Shanklin, Luccombe, Blackgang, and Whale chine. The fresh-water walden formation is the lowest visible in the island, and is seen in the cliffs of Brook to the w., and of Redcliff bay to the east. Bones of the colossal iguanodon and other saurians are found in this formation.

The soil of the island is very varied, both in nature and fertility. That of the northern half is, to a considerable extent, a cold, stiff clay, more suited for the growth of wood, especially oak, than corn. Of late years, however, much of the woodland has been cleared, and judicious draining operations, in which the late prince consort led the way on the royal domain of Osborne (near East Cowes), have produced very beneficial results. Farming is still on the whole somewhat primitive; even on large farms the flail may still be seen in use. The soil of the s. half is chiefly a red loam, which is exceedingly productive, especially in crops of barley, and, in the more rich and sheltered lands, of *white* wheat. *Red* wheat is grown in abundance in other parts of the island; while the stiffer clays of the n. grow capital crops of oats. The chalk downs afford admirable pasturage for sheep, which are celebrated for the pureness of their wool, chiefly exported to Yorkshire, and which furnish the London market with early lamb. The chief exports are wool, corn, flour, cement stones (septaria), and white glass-house sand. The principal communication between the mainland and the island is by steamboats plying daily between Portsmouth and Ryde, at both of which places there are good landing-piers.

The *history* of the isle of Wight presents but comparatively few points of interest. It is supposed, with much probability, to have been the tin mart of the Greek traders mentioned under the name of *Ietis* by Diodorus Siculus. The Romans knew it as *Vecta* or *Vectis*, which is merely the Latinized form of the native name. It was conquered for the Romans by Vespasian in the reign of Claudius (43 A.D.). Cerdic, the founder of the kingdom of Wessex, took the island 530 A.D., and handed it over to his nephews, Stuf and Wiltgar. In 661 A.D. it was reduced by Wulphere of Mercia, and given to Ethelwold, king of Sussex, from whom it was wrested (686 A.D.) by Ceadwalla of Wessex, to whom, under the benign influence of Wilfrid, archbishop of York, the island owes the introduction of Christianity. During the three centuries preceding the Norman con-

quest, it was repeatedly devastated by the Danish pirates, who made it their stronghold, to which they retired with their plunder. William the conqueror gave it to his kinsman, Fitz-Osborne; Henry I. transferred it to the family of De Redvers, in whose hands it remained till the reign of Edward I., when it passed by sale to the crown. During the French wars of Edward III. and his successors, the island was repeatedly invaded and pillaged by the French. At the close of the reign of Henry VIII., the armada dispatched by Francis I., under the command of D'Annebault, made several landings on the coast, and inflicted some damage, but were ultimately driven back by the prowess of the islanders. The most interesting event in the history of the island is the imprisonment of Charles I. in the castle of Carisbrooke, after his flight from Hampton court, from Nov. 23, 1647, to Sept. 15, 1648. Carisbrooke was also the place of the imprisonment of his children, prince Henry and the princess Elizabeth, the latter of whom died there, and was buried in Newport church, where a beautiful monument by baron Marchetti has been erected to her memory by queen Victoria.

Among the celebrated natives of the isle of Wight we may notice Dr. Robert Hooke, the experimental philosopher, born at Freshwater, 1635; and Dr. Thomas Arnold of Rugby, the regenerator of public-school education, born at East Cowes, 1795.

The antiquities are not numerous. Sepulchral barrows occur on the downs, and Saxon burial places have been discovered in several localities. There are the remains of a Roman villa, with a tessellated pavement, at Carisbrooke. The remains of Quarr abbey, near Ryde, are very scanty. Carisbrooke castle is a fine ruin, occupying a commanding position. The churches are picturesque, but not remarkable for beauty of architecture. There are but few monumental brasses or other sepulchral memorials of interest.

WIGHTMAN, WILLIAM MAY, D.D., LL.D.; b. S. C., 1803; graduated Charleston college, 1827; admitted to South Carolina Methodist Episcopal conference, 1829; supplied several churches; was agent for Randolph Macon college, Virginia; professor of English literature there, 1837; presiding elder, 1839; editor of the Charleston *South-eastern Christian Advocate*, 1840-54; member of the Louisville convention which organized the Methodist Episcopal church, South, 1845; president of Wofford college, Spartanburg, 1854; chancellor of the Southern university, Greensboro, Ala.; elected bishop of Methodist Episcopal church, South, 1863. He published the life of bishop Capers.

WIGTON, a market and small manufacturing t. of Cumberland, in the midst of a specially agricultural district, $11\frac{1}{2}$ m. by railway s.w. of Carlisle. It carries on manufactures of ginghams and checks. Pop. '71, 3,425.

WIGTOWN, a co. forming the s.w. corner of Scotland, is bounded on the w. by the Irish channel, n. by Ayrshire, e. by the stewartry of Kirdendubright and the Solway firth, and s. by the Irish sea. Its extent from e. to w. is computed at from 32 to 34 m., and from n. to s. 24 to 28 miles. This county, which constitutes West Galloway, was formed about the year 1341, and is between $54^{\circ} 38' - 55^{\circ} 4' \text{ n. lat.}$, and $4^{\circ} 16' - 5^{\circ} 6' \text{ w. longitude}$. Wigtown is somewhat irregular in form, being deeply intersected by two arms of the sea, one of which, loch Ryan, a long narrow inlet, stretches southward from the n.w. corner for fully 9 m. into the county, while Luce bay on the s. makes a wide indentation 18 m. long with an average of 12 wide, the heads of the inlet and bay being only 6 m. apart. The western part of Wigtown, known as the *Rhins of Galloway*, thus forms a peninsula whose length (from n. to s.) is 28 m., and breadth $1\frac{1}{2}$ -6 m.; its northern extremity is Corsewall point, and its southern the Mull of Galloway, each promontory being provided with a light-house. The south-eastern half of Wigtown is separated from the stewartry by Wigtown bay, 15 m. long and 14 m. wide at its mouth, and between this latter and Luce bay, Wigtown extends southward in a blunt triangular form, terminating in Burrow Head. The inhabitants of Wigtown were originally of Celtic origin, and up to the middle of the 16th c., a Celtic dialect was universally spoken; and for a century afterward it was in use in the remote districts. Wigtown is irregular in its surface, but its eminences are inferior in height to those of any other county of Scotland—none of them exceeding 500 feet. The soil is varied, and—with the exception of a portion lying along the sea-shore, especially in the s.e., which consists of a rich loam—the quality is mostly inferior. There is a large extent of moss and moor, mostly of a very poor and unproductive nature, judging from the appearance and produce of much of what has been reclaimed. There has, however, been a considerable improvement made of late years in farm-buildings. The climate is rather mild, but moist, the rainfall being comparatively great. There are many dairy establishments in this county, almost exclusively for making cheese similar to the Somersetshire cheddar. The cows are frequently let for hire at from £9 to £12 per cow, the farmer supplying all food, and the dairyman the labor. Most of the cows are of Ayrshire breed; it is difficult to obtain the pure native breed of cattle; and the Galloway pony, formerly in such vogue, is now hardly to be met with. The area of Wigtown is over 512 sq. m., or 327,906 acres, of which about three-fifths would be unprofitable to reclaim. The government returns for 1878 give 146,089 acres under all kinds of crops, bare fallow, and grass; under corn crops, 38,188; under green crops, 18,752; clover, sanfoin, and grasses under rotation, 52,437; permanent meadow pasture, 36,201. There were 5,792 horses for the use of agriculture; also 49,401 cattle, 131,030 sheep, and 9,491 pigs.

Besides numerous small streams, Wigtown contains three rivers of considerable size, the Cree, which forms the eastern boundary, and the Bladnoch—both of which fall into Wigtown bay—and the Luce, which empties itself into Luce bay; the former two are navigable for a few miles, and yield salmon and trout. The county also possesses several small fresh-water lochs. In the Rhins of Galloway, on the s.w., is situated the parish of Kirkmaiden, the most southerly point in Scotland—hence “from Maidenkirk to John o’ Groat’s.” There were at an early period a considerable number of religious houses in the county; and the church, believed to be the oldest in Scotland, founded by St. Ninian, was built near the site of what is now the village of Whithorn. At the reformation there were 21 parishes; the number was reduced to 17, but is now 20. The principal towns are Wigtown, Newton-Stewart, Stranraer, and Whithorn. There is no mineral wealth, and little trade or manufacture carried on in Wigtown. There is a distillery at Bladnoch, a woolen manufactory at Kirkeowan, and some saw-mills and starch mills at Stranraer and elsewhere. The mail-coach was first run through Wigtown in 1804, and was only superseded by a railway from Castle Douglas to Port Patrick in 1857. This line is now connected with Dumfries eastward and with Glasgow, by way of Girvan, to the north. The valued rent of Wigtown in 1674 was £5,634; the valuation for 1878-79 was £250,779. Pop. ’71, 38,830; parliamentary constituency (1878-79), 1561.

WIGTOWN, a royal, municipal, and parliamentary burgh, market-town, and seaport in the s.w. of Scotland, capital of the county of Wigtown or West Galloway, is situated on Wigtown bay, near the mouth of the Bladnoch water. It is 40 m. w.s.w. of Dumfries, and nearly 150 m. distant by railway from Edinburgh. The parish church was erected in 1852. It is of Gothic architecture, and much superior to the ordinary run of country churches. In the church-yard there are three tombstones in memory of martyrs who suffered in the time of episcopal persecution. Two of them are old. On the summit of the Windyhill, the highest ground in the neighborhood of the town, an obelisk of freestone was placed some years ago, in memory of these same martyrs—two of whom, women, are said to have been drowned here. The authenticity of this event, though lately questioned by some, is doubted by very few in the locality where it is said to have happened. A large and very handsome building, which is used as a town-hall and court-house, was erected in 1863. Pop. ’71, 1780. There is no particular trade carried on in the town. At Bladnoch bridge, however, which is held to be part of the burgh, although nearly three-fourths of a mile distant to the s., there is a distillery of considerable extent; also an iron foundry and a coach-building establishment. Wigtown unites with Whithorn, Stranraer, and New Galloway in electing a member to the house of commons. In 1877, 980 vessels of 60,396 tons entered and cleared the port.

WIKANA, the *Wacika des Indes* of the French, a dietetic preparation of cacao much used in France for invalids. It consists of roasted cacao nibs and sugar, in the proportion of three parts of the latter to one of the former, well mixed together, and flavored with cinnamon, vanilla, ambergris, and musk.

WILBERFORCE, SAMUEL, D.D., 1805-73; b. England; educated at Oxford; ordained 1828, and appointed curate of Chickendon; rector of Brightstone, Isle of Wight, 1830; select preacher before the university of Oxford, 1837; archdeacon of Surrey, rector of Alverstoke, and chaplain to prince Albert, 1839; canon of Winchester cathedral, 1840; Bampton lecturer, 1841; sub-almoner to the queen, 1844; dean of Westminster, 1845; bishop of Oxford the same year, and chancellor of the order of the garter; lord high almoner of the queen, 1847. He was a high churchman, but opposed ritualism. He was one of the ablest debaters in the house of lords. He published *Sermons at Oxford; Eucharistic; Note-Book of a Country Clergyman; Rocky Island and other Parables; Agathos and other Stories; History of the American Episcopal Church*.

WILBERFORCE, WILLIAM, was b. at Hull, Aug. 24, 1759. His father was a wealthy merchant, descended from an old family, proprietors of Wilberfoss, in the e. riding of York. Wilberforce, at the age of 9, on his father’s death, was sent to school at Wimbledon, where, under the care of a pious aunt, he ran the risk of becoming a Methodist. But his mother did not approve of a serious education, and removed him to a Yorkshire school, where the religious impressions he had received were soon dissipated by a life of gayety. His constitution was delicate, but he was quick and spirited, and fond of society, in which his lively conversation and musical talent made him a great favorite. While at school, he addressed a letter to a York paper “in condemnation of the odious traffic in human flesh,” a subject he seems never afterward to have lost sight of. At 17 he entered St. John’s college, Cambridge, and in due time he passed his examinations with credit. He came, on attaining his majority, into possession of a large fortune, and determined to enter parliament. In 1780 he was returned for Hull. He had known Mr. Pitt when at Cambridge, and in London they became inseparable friends. Wilberforce, in parliament, however, remained independent of party. The elevation of Mr. Pitt to the premiership gave him an opportunity of taking office, but he declined to do so. He rendered, however, efficient service to his friend. In Mar., 1784, on the eve of a dissolution, he spoke at a county meeting in York, called to vote an address against the coalition ministry; and such was the effect of his eloquence, that when he had concluded, a

resolution had been come to by the freeholders that he should be asked to stand for the county. He did so; and in spite of opposition from the great whig families, he was returned without a contest. Wilberforce's success in the leading county set an example to other constituencies, which was of very great advantage to the Pitt ministry. In the same year, Wilberforce made a tour on the continent with some ladies of his family and Isaac Milner, the dean of Carlisle, during which the serious impressions of his youth seem to have been revived. In 1787 he in a great measure eschewed gayety, and founded an association for the discouragement of vice; and in the following year, while in very bad health, he entered on his great struggle for the abolition of the slave-trade, to which he thenceforward dedicated his whole time. He was powerfully supported by the Quakers, and by Mr. Thomas Clarkson, who kept alive interest in the subject beyond the walls of the house of commons. In 1789 he first proposed the abolition of the slave-trade in the house of commons, and met, as he expected, with powerful opposition. In 1804 his bill was first carried through the commons; it was thrown out in the lords; and in the following year it was again lost in the commons. In 1806, however, a resolution was moved by Mr. Fox, pledging the commons to a total abolition of the slave-trade in the following session. It was adopted by the lords. Just before the discussion began in Jan., 1804, a work had been published by Wilberforce against the slave-trade, which had a marked influence on public opinion and the subsequent debates. The bill was passed by the lords. In the commons it was carried by an enthusiastic majority. Sir Samuel Romilly, who supported the measure, compared the feelings of Napoleon, then at the height of his glory, with those of the English philanthropist, "who would that day lay his head upon his pillow, and remember that the slave-trade was no more;" and the whole house burst into applause, and greeted Wilberforce with enthusiastic cheers. Wilberforce now sought to secure the abolition of the slave-trade abroad. He at the same time entered on an agitation for the total abolition of slavery itself. Declining health, however, compelled him in 1825 to retire from parliament, in which, since 1812, he had sat for the borough of Bramber. The movement against slavery was then intrusted to sir T. Fowell Buxton. Three days before Wilberforce's death, news was brought him that the abolition bill had passed a second reading, and he thanked God he had lived to see his countrymen spend 20 millions sterling in such a cause. He died July 29, 1833, and was buried as a national benefactor in Westminster abbey. In 1797 Wilberforce married the daughter of Mr. J. Spooner, the banker of Birmingham, by whom he had a large family. Wilberforce is the author of a *Practical View of Christianity*, which, on its publication in 1797, met with great success.—See the *Life of Wilberforce*, by his sons. His third son, Samuel (born 1805, died 1873), became bishop of Oxford in 1845, and bishop of Winchester in 1869. He distinguished himself in parliament by his eloquence, and was author of a *History of the Episcopal Church in America*, *Agathos*, and *The Rocky Island*, allegories, sermons, etc.

WILBUR, HERVEY BACKUS, b. Mass., 1820; graduated at Amherst college, 1838; studied medicine and engineering, and became a practicing physician at Barre, Mass. In 1848 he received several idiot pupils into his house, treating them after Seguin's method. In 1857 the N. Y. legislature established an experimental school for idiots at Albany, which in 1854 became fully organized as the state idiot asylum at Syracuse, and of which Dr. Wilbur has long had charge.

WILCOX, a co. in s.w. Alabama on the Alabama river; 900 sq.m.; pop. '80, 31,832—31,749 of American birth, 25,096 colored. Co. seat, Camden.

WILCOX, a co. in central Georgia; 500 sq.m.; pop. '80, 3,109—3,106 of American birth; 698 colored. Co. seat, Abbeville.

WILDBAD, a small t. of Württemberg, in the Black forest, romantically situated in a valley watered by the Enz, about 32 m. s.s.e. of Carlsruhe, 18 m. of which are by railway to Pforzheim, and the remaining 14 by road, through a beautiful portion of the Black forest. It is noted for its thermal springs and baths, the water of which ranges from 90° to 100° Fahr. in temperature. The baths consist of numerous basins formed round the springs as they gush from the rocks, and floored with sand for the comfort of the bathers. From the circumstance that these baths are natural, or *wild*, and not artificial, the town derives its name. The waters are nearly pure, the principal ingredient they contain being common salt. They are peculiarly beneficial for rheumatism, gout, stiffness of limbs, paralysis, etc., and for some skin-diseases. The season lasts from May till September, and the number of visitors has steadily increased from 470 in 1820 to about 5,000 annually. Goiter abounds here and in the neighboring close valleys of the Black forest. Pop. '75, 3,236.

WILD CHERRY, two trees and one shrub, belonging to the rose family (order *rosaceæ*), sub-order *amygdalæ*, genus *prunus*, indigenous to North America. 1. *P. Pennsylvanica*, or wild red cherry, is a tree from 20 to 30 ft. high, common in rocky woods, particularly in the northern states, flowering in May. Leaves oblong-lanceolate, pointed, finely and sharply serrate, green and smooth on both sides; flowers in a cluster on long pedicels; fruit round, light-red, very small, with thin pulp; stone globular. 2. *Prunus serotina*, the wild black cherry, whose timber is so much prized for cabinet and other work, is a fine tree with gray, sometimes rather shaggy bark on the trunk, and reddish

limbs, often growing in the western states to 80 ft. in height and 2 ft. or more in diameter, but smaller in the Atlantic states; leaves lanceolate-oblong, taper-pointed, serrate, with incurved, short, and callous teeth, thick, shining above; flowers, which appear in June, and fruit, in long racemes; fruit purplish-black, about the size of a common pea, but often larger on rich alluvial soils; when very ripe and large, they are agreeable to the taste. In some of the older sections of New York it was many years ago planted in the fields and along the fences, where some of the trees are still growing, but few are now planted. *P. Virginiana* is the common choke-cherry, but the name has been erroneously applied in the dispensatories to the wild black cherry just described. It is a tall, rather slender shrub (sometimes it may be called a tree), from 8 to 15 ft. high, with grayish bark, leaves oval, oblong, or obovate, blunt-pointed, sharply serrate; racemes short and close; petals roundish; fruit red, turning to dark crimson, and very astringent until perfectly ripe, when it is not unpleasant, if large, and growing on good soil; flowers in May; grows along fences and river banks, especially northward.

WILD-FOWL, a popular term, synonymous with *water-fowl*, and generally applied to web-footed birds, but sometimes employed also to include herons, plovers, and other birds which frequent rivers, lakes, and sea-shores. The different kinds are noticed under their proper heads.—*Wild-fowling* is one of the most difficult, and yet one of the most interesting pursuits of the British sportsman. *Rock-fowling* (see FOWLING) is not included under this term. Wild-fowling is prosecuted in a great variety of ways. The wild-fowler seeks his game with a gun and dog, generally a retriever; or he uses a small boat, called a *punt*, adapted to the shallow waters in estuaries which wild-fowl frequent; or he proceeds a little further to sea, in a boat with sails; sometimes he employs a yacht, or he endeavors to approach his game on land by the aid of a *stalking-horse*; or he has recourse to decoys, and other contrivances, by which great numbers of wild-fowl are captured. It is chiefly on the eastern and south-eastern coasts of England that wild-fowl abound in Britain, and they are most abundant in severe winters, coming as migratory birds from the north; but the draining of the fen-lands has greatly reduced their numbers. The ancient Greeks and Romans captured wild-fowl by various kinds of nets, one of which, called the *argumentum*, was not unlike the modern decoy-pipe, the birds, however, being generally driven, and not enticed into it. The *panthera* was a large purse or drag-net, placed along the banks of rivers. The ancient wild-fowlers sometimes practiced a system of decoying, apparently less perfect than the modern system, but essentially of the same nature, enticing the birds to their snares by movements intended to excite their curiosity, and for this purpose the fowlers clothed themselves in feathered jerkins, and danced with peculiar motions and gestures. Nooses and bird-line were also much employed in ancient times. The Egyptians made much use of the *throw-stick*, a missile similar to the boomerang of the Australians, and which was dexterously thrown so as to hit the neck of the bird. In more recent times, falconry was much practiced for the capture of wild-fowl. The gun, decoys, and flight-ponds are now chiefly in use. Although many wild-fowl are killed with the ordinary fowling-piece, it is not thus that the greatest numbers are obtained. Much larger guns are used in punts and yachts, by which many are killed at one shot. The *stalking-horse* is still used in some parts of England, in order to enable the wild-fowler, armed with an ordinary fowling-piece, to get within reach of the birds, whilst they are feeding on the level swampy ground which they chiefly frequent. A horse well trained for the purpose, advances toward them, the fowler concealing himself on the side of it furthest from them. An ox is sometimes trained for this use, and indeed the kind of animal with which the birds are most familiar in the locality is most suitable. Artificial stalking-horses are sometimes employed, made of canvas, and stuffed with straw, the head being down, as if grazing. This practice is common in some parts of France. The use of the stalking horse is very ancient. Wild-fowl shooting is not unattended with danger. In pursuit of wounded birds on the ooze, the sportsman or fowler must use *splashers*, thin boards about 18 in. square, attached to the feet, to prevent him from sinking; and if he fall, it is very difficult for him to regain his feet. He cannot raise himself by resting his hands on the mud, which only makes him sink deeper and deeper, nor can he do it by getting upon his knees. The only method is to roll over on the back, drawing the arms out of the mud, and placing one foot with his splashers firmly on the ooze, to press both hands on the knee of the leg so raised, and give a vigorous spring. The punter is also in great danger of losing himself in foggy weather when pursuing wounded birds, and being unable to get back to his punt, when a fearful death awaits him on the return of the tide.

The curly-coated retriever is the best dog for the wild-fowl shooter, but good training is necessary to fit the dog for his use. The punter ought not to carry a dog with him, because the dog, having no opportunity of exercise after his return from the water, soon suffers from the cold of the winter weather in which the sport is pursued.

Sledging for wild-fowl is practiced by professional wild-fowl shooters on some parts of the English coast, particularly that of Hampshire. The sledger traverses the oozes by means of a small light sledge called a *launching-punt*, with a gun in the fore-part. He pushes it ahead, crawling on his knees, and often at full length on the mud, till he gets within range. His most severe work is on sands and dry ground.

The *gunning-punt* is a small generally flat-bottomed boat, about 17 ft. in length, with a gun placed in the front of it, generally carrying about half a pound of shot at a charge. The punt must be nicely trimmed, so that the gun is nearly on a level with the surface of the water; and the fowler, having approached the birds where they are congregated, often kills great numbers by its discharge. The sport is pursued both by day and by night. The punt is generally constructed to carry only one person, and although he rows it in the ordinary manner till he discovers the birds, he is obliged then to lie down in the punt, and force it forward by a pole or by the oars with no little exertion, till he gets within range. The danger is not inconsiderable of his mistaking another punt in the darkness of night for an assemblage of wild-fowl, and firing at his fellow-sportsman. In a clear moonlight night, he proceeds if possible, against the light, so that he may see, and not be seen. By a successful shot, great numbers of water-fowl are often killed. The punt-gun is capable of being *tipped*, that is, elevated so as to shoot water-fowl on the wing; and the most successful shots are often made by waiting till they rise, and tipping the gun. The punter cannot expect to recover all his wounded birds, and there are men on some parts of the coast who make their living during winter mostly by seeking for them in the morning.—The *sailing-punt* is a mere modification of the ordinary gunning-punt; the sail saving much hard work to the fowler, but its use is attended with great danger, and it is utterly unsuitable for rough water. A *shooting-boat* is therefore sometimes used; but in it the gun cannot be fixed level with the surface of the water, as in the punt, and still more is this the case with the *shooting-yacht*. The practice of the sportsman is therefore considerably different, and the best shots are generally made after the birds are on the wing. The helmsman of the shooting-yacht must be quick and skillful in luffing up, in such a manner as to cross the flight of the birds, that they may be well exposed to the gun, which is generally larger than the punt-gun. Great numbers of wild-geese, swans, etc., are often killed from the shooting-yacht. In approaching the birds, the greatest caution is necessary, and the men in the yacht must be carefully concealed behind the bulwarks.

Notwithstanding the draining of fen-lands, many of the decoys of the eastern coast of England are still very valuable, and in some instances they afford a considerable part of the living of the parochial clergy. A good decoy-pond attached to a rectory adds not a little to its value. It is in severe winters that the decoy-pond is most productive. It must be in a secluded situation, and the proprietor takes care to keep it as secluded as possible, permitting no use of the gun or rifle in its neighborhood. An extent of three or four acres is about the best for a decoy-pond. Very large ones are found to be comparatively much less productive. The decoy-pond ought to be surrounded with trees and copse, reeds and sedges being permitted to flourish near the water. Several *pipes* are led off from the pond, in different directions, ditches of 6 or 8 in. in depth, of a curved form, and becoming narrower toward the extremity. It is in these pipes that the wild-fowl are caught, particularly mallards, teal, and widgeons, and often in very great numbers. The length of the pipe is generally from 60 to 80 yds., its breadth at the mouth from 20 to 30 ft., diminishing to 2 ft. at the extremity, where it terminates in a tunnel-net, generally carried out on the dry land. The whole pipe is spanned with a light netting, spread upon semicircular bars of iron rod, in an arch of about 12 ft. above the water at the entrance, but becoming lower as the pipe becomes more narrow. To attract wild-fowl to the pond, and to induce them to enter the pipe, *decoy-ducks* are kept, constant inhabitants of the pond, and regularly fed. Wild-fowl come more readily to the pond because of their presence, and follow them also to the mouth of the pipe, and into it, when they come at the well-known whistle of the decoy-man, to feed on the grain which he scatters for them on the water. It is only thus that the decoy-ducks are of use. They are not trained in any way, nor do they display any intelligence beyond response to the whistle which invites them to their food. Very different is the case with the decoyer's dog, the *piper*, so called not from any vocal powers, but from his use in enticing birds into the pipe. The dogs best adapted for this purpose are of a peculiar breed, small, fox-like, and very lively and frolicsome. They are very carefully trained, and their peculiar qualities seem to be in some measure hereditary. On the convex side of the curve of the pipe, for about 30 or 40 yds., instead of netting coming down to the ground, screens made of reeds are placed of height sufficient to conceal the decoyer; but they are placed obliquely, with narrow outlets between them, through which his dog may pass, and with bars in the intervals about 18 in. high, for the dog to leap over. When the wild-fowl have been attracted to the mouth of the decoy, and the decoyer, peeping through the screens, perceives that they are in the proper situation, he sends out the dog, which makes sportive gambols in their sight, and they are attracted by the strange object, as sheep are when a small dog plays about in the field where they graze. They enter the pipe in pursuit, as if for gratification of their curiosity, and the dog leaps over the first leaping-bar, and disappears behind the screens, where his master immediately rewards him with a piece of cheese or other delicacy. When the wild-fowl have advanced a little further, the dog is sent out again, repeats his gambols, leaps over the second leaping-bar, and gets a second piece of cheese. The curiosity of the birds seems to increase, and when they have proceeded far enough the man shows himself, whereupon a rush is made by the birds toward the far end, where they are captured. The dog is trained to keep perfect silence. A single bark would disperse the birds. The success of the decoyer depends very much on the

state of the weather, and he must consider the direction of the wind in order to the choice of the pipe he is to use. Into such details, however, we cannot enter. It is in the daytime, and not by night, that wild-fowl are captured in the decoy. They generally leave the decoy-pond at night for neighboring feeding-grounds. The decoyer often finds it profitable not to attempt the capture of birds when they first appear on the pond, but to wait for a few days, when they congregate in greater numbers.

Decoys are of so great value that many acts of parliament have been passed for their regulation and protection. A decoy which has been established for twenty years enjoys certain privileges secured by law, particularly as to the quietude of its vicinity, which must not be disturbed by the firing of guns at wild-fowl apparently going to the pond, even by the proprietors of land over which they pass.

Flight-ponds alone remain to be noticed. These are used chiefly for the capture of pochards or dunbirds, which very seldom enter the pipes of the decoyer. The same pond is sometimes used both as a decoy-pond and a flight-pond. The pochard, having its legs placed far back, cannot rise from the water so suddenly as the wild-duck or widigeon, and skims the surface for many yards, proceeding by a very gradual ascent. To capture flights of pochards, nets are used, which are fixed to a cumbrous apparatus of poles at the side of the pond. The pond may be about 70 or 80 yds. square. On an embankment, about 10 yds. from the water, strong posts are fixed, about 12 ft. high, two together, and about 50 yds. apart—the corners of the pond being generally occupied by trees. Further back, about 50 ft., are slighter posts, about 15 ft. high. Other posts are required for the working of the net, the position and use of which we cannot explain; but the purpose of the whole is that the net, which is of the form of a parallelogram, may be suddenly thrown up into the air. In order to this, it is attached to cross-bars, which work between the twin posts, and heavily-weighted boxes attached to two poles aid in bringing it into an erect position when required. The fowler's skill relates very much to the moment of raising of his net, which he does by drawing a bolt or trigger. The net ought to rise so as fully to confront the birds as they issue from the pond. Pens are formed on the embankment in front of the net of reed-screens about 3 ft. high, by 2 or 3 ft. square, and the birds falling into them on being thrown back from the net, are caught, not being able to rise again. The number of pochards caught at once is sometimes very great. For full particulars concerning wild-fowling, the reader is referred to col. Hawker's well-known work on *Shooting*, and to *The Wildfowler*, by Folkard. An act was passed in July, 1876, for the preservation of wild-fowl, making it punishable by fine to kill them, or to use any instrument for that object, during the breeding season—Feb. 15 to July 10.

Folkard, in his excellent work upon wild-fowling, remarks that writers upon sporting literature generally apply correct terms to game and birds of the land, while water-fowl are invariably classed by them as "flocks." The modern terms, as applied to water-fowl, are, according to Folkard, as follows: "A herd of swans. A gaggle of geese (when on the water). A skein of geese (when on wing). A paddling of ducks (when on the water). A team of wild-ducks (when flying in the air). A sord or suit of mallards. A company of widigeon. A flight or rush of dunbirds. A spring of teal. A dopping of sheldrakes. A covert of coots. A herd of curlews. A sedge of herons. A wing or congregation of plovers. A desert of lapwings. A walk of snipes. A fling of oxbirds. A bill of ruffs. A small number of wild-fowl, as ducks and geese (about 20 or 40), is termed a 'trip.' The same of widigeon, dunbirds, or teal, is termed a 'bunch;' and a smaller number (from 10 to 20) is called a 'little knob.' Of swans, it would be said, a 'small herd;' and sometimes of geese, a 'little gaggle,' or a 'small skein;' and so of ducks, a 'short' or 'long team.'"

WILD HUNT (Ger. *wilde* or *wüthende jagd*; also *wildes* or *wüthendes heer*, wild or maddening host; *nachtjäger*, night huntsman, etc.), the name given by the German people to a fancied noise sometimes heard in the air at night, as of a host of spirits rushing along over woods, fields, and villages, accompanied by the shouting of huntsmen and the baying of dogs. The stories of the wild huntsman are numerous and widespread; although varying in detail, they are uniform in the essential traits, and betray numerous connections with the myths of the ancient gods and heroes. The root of the whole notion is most easily discernible in the expression still used by the peasants of lower Germany when they hear a howling in the air, "*wode hunts*" (*Wode jaget*), that is, Wodan or Odin marches, as of old, at the head of his battle-maidens, the Walkyries, and of the heroes of Walhalla; perhaps, too, accompanied by his wolves, which, according to the myth, along with his ravens, followed him, taking delight in strife, and pouncing upon the bodies of the fallen. The heathen gods were not entirely dislodged from the imagination of the people by Christianity, but they were banished from all friendly communication with men, and were degraded to ghosts and devils. Yet some of the divine features are still distinctly recognizable. As the celestial god Wodan, the lord of all atmospheric and weather phenomena, and consequently of storms, was conceived as mounted on horseback, clad with a broad-rimmed hat shading the face, and a wide dark cloak; the wild huntsman also appears on horseback, in hat and cloak, and is accompanied by a train of spirits, though of a different stamp—by the ghosts of drunkards, suicides, and other malefactors, who are often without heads, or otherwise shockingly

mutilated. One constant trait of the stories shows how effectually the church had succeeded in giving a hellish character to this ghost of Wodan—when he comes to a *cross* road, he falls, and gets up on the other side. On very rare occasions, the wild huntsman shows kindness to the wanderer whom he meets; but generally he brings hurt or destruction, especially to any one rash enough to address him, or join in the hunting-cry, which there are many narratives of persons in their cups having done. Whoever remains standing in the middle of the highway, or steps aside into a tilled field, or throws himself in silence on the earth, escapes the danger. In many districts, heroes of the older or of the more modern legends take the place of Odin; thus, in Lusatia and Orlagan, Berndietrich, that is, Dietrich of Bern; in lower Hesse, Charles the Great; in England, king Arthur; in Denmark, king Waldemar. The legend has also in recent times attached itself to individual sportsmen, who, as a punishment for their immoderate addiction to sport, or for the cruelty they were guilty of in pursuing it, or for hunting on Sunday, were believed to have been condemned henceforth to follow the chase by night. In lower Germany, there are many such stories current of one Hakkelberend, whose tomb even is shown in several places. Still, the very name leads back to the myth of Wodan, for Hakkelberend means literally the mantle-bearer (from O. H. Ger. *hakkul*; O. Norse, *hökull* or *hékla*; Ang.-Sax. *hæcle*, drapery, mantle, armor; and *bern*, to bear). The appearing of the wild hunter is not fixed to any particular season, but it occurs frequently and most regularly in the twelve days between Christmas and Epiphany.

Another version of the wild hunt is to be found in the legend prevalent in Thuringia and the district of Mansfeld. There the procession, formed partly of children who had died unbaptized, and headed by Frau Holle or Holda (see BERCHTA), passed yearly through the country on holy Thursday, and the assembled people waited its arrival, as if a mighty king were approaching. An old man, with white hair, the faithful Eckhart (see TANNHÄUSER and VENUSBERG), preceded the spirit-host, to warn the people out of the way, and even ordered some to go home, so that they might not come to hurt. This is the benign goddess, the wife of Wodan, who, appearing under various names, travels about through the country during the sacred time of the year. This host of Holda or Berchta also prefers the season about Epiphany. In one form or other, the legend of the wild hunt is spread over all German countries, and is found also in France, and even in Spain. In lower Germany, it has been preserved in an older and purer form than in Upper Germany. It has probably some connection with Celtic mythology, but not apparently with the Slavonic.—See Grimm, *Deutsche Mythologie*.

WILDE, RICHARD HENRY, 1789-1847; b. Dublin, Ireland; came to this country in 1797; studied law; was admitted to the bar, 1809, and rapidly rose in his profession; became attorney-general of Georgia, and was a member of congress, 1815-17, 1824-25, and 1827-35. He was a poet of some merit, and in his stay in Europe, 1835-40, made interesting documentary discoveries in regard to Dante, and found an original painting of the poet. He wrote *The Love, Madness, and Imprisonment of Tasso* (1842) and *Hesperia*. His poem, *My Life is like a Summer Rose*, was praised by Byron. From 1843 to his death he was professor of law in the Louisiana university.

WILDEBEEST. See GNU, *ante*.

WILDER, MARSHALL PINCKNEY, b. N. H., 1798; became a merchant in Boston in 1856. He has been a member of both houses of the Massachusetts legislature, was president of the senate in 1850, and has been a member of the executive council. He has done much for the progress of agriculture and horticulture; was active in establishing the state agricultural college, and the state board of agriculture; and was long president of the Massachusetts horticultural society, and the American pomological society.

WILDERNESS, BATTLES OF THE. The name given to a series of engagements which took place in Virginia, between the federal and the confederate forces, in 1864. The "Wilderness" is an extensive tract of table-land stretching southward from the s. bank of the Rapidan, seamed with ravines, and, excepting a few small clearings, covered with a dense growth of dwarf timber and underbrush. At the period of the opening of the campaign of 1864, of the army of the Potomac, the confederate army, under gen. Lee, occupied the bluff ridges which skirt the s. bank of the Rapidan. This was a position made strong by nature; and which had been so strengthened by works, that a direct attack upon it would have proved fruitless; and he could only be drawn from it by a turning movement. It would have been more easy to have flanked Lee's left; but that movement would have separated Grant too far from his base of supplies, and Grant concluded to cross the Rapidan by its lower ford, and turn Lee's right. The plan of gen. Grant was, in fact, to gain the rear of the confederate army, and he had given the instructions necessary to the fulfillment of this purpose to his corps commanders. But instead of retreating out of the region which bears that name, Lee fought the battles of the Wilderness.—The army of the Potomac, under the immediate command of gen. Meade, broke camp on May 3d, 1864, and crossed the Rapidan by the various fords, the second corps under gen. Hancock having the left, and bivouacking at Chancellorsville. One hundred thousand men, with the enormous train of 4,000 wagons, were permitted by Lee to cross the river unmolested; doubtless with the design that this vast mass of men and impediments should become entangled in the wilderness, and be destroyed or captured. On the morning of the 5th the confederates attacked the right of

the union advance, and later in the day the left became heavily engaged behind breastworks hastily thrown up, and such natural defenses as the character of the country offered. This day's fight was marked by the loss of brig. gen. Alexander Hays, a chivalrous and intrepid union soldier and leader. The fight on the 5th was mainly with A. P. Hill's corps, and on the 6th Longstreet came into action with a heavy force, against which were brought the 2nd and a part of the 9th corps, supported by Sheridan's cavalry, which sharply attacked the enemy. While the right of the union line was being severely pressed by the confederates, Longstreet attacked the left in force, and drove it back with heavy loss, being finally supported by re-enforcements commanded by Lee in person, when the union breastworks were captured, though they were afterward retaken. After the fight at Chancellorsville; which resulted in its defeat with very heavy loss, the federal army retreated along what was known as the Brock road. In this, the last battle of the wilderness, ten thousand men were killed and wounded, on both sides; the union loss being the greater, particularly in officers. It had been gen. Grant's design, in crossing the Rapidan, to turn Lee's flank, and get between him and Richmond. This intention was temporarily defeated by the stern resistance offered in the wilderness; but with the dogged tenacity which characterized him, Grant returned to it immediately after the fight, ordering his columns forward toward Spottsylvania court-house, in which movement Lee immediately followed him, marching his army by roads nearly parallel with that followed by the union forces. There was no fighting on the 7th, and the union army pushed forward on that date with the 5th corps in the advance, with orders to siege Spottsylvania court-house. In this, however, the confederates anticipated them, and when the 5th corps (gen. Warren) reached the open plain near the court-house, it was met by a murderous fire on the part of Longstreet's corps, which had already reached this point. This was on the 8th, late in the afternoon, and the union army formed under fire, the 5th corps being supported by the 2d (Hancock's), with a brigade of heavy artillery massed in rear of the line of battle, but which was afterward withdrawn by orders from headquarters. On the 9th there was constant firing by confederate sharpshooters, and now fell gen. Sedgwick, the brave commander of the 6th corps, who was shot in the face, while rallying his men. There was no heavy fighting on the 9th, but on the 10th there was a general attack all along the line, and the union army suffered greatly and was forced to retire. On the 12th the series of disasters was in a measure retrieved; the celebrated "Stonewall" confederate brigade being captured almost in its entirety, including 4,000 prisoners, 20 pieces of artillery, with horses, caissons, and material complete, several thousand stand of small arms, and more than 30 battle-flags; among the prisoners were maj. gen. Edward Johnson and brig. gen. George Stuart. It was in this day's fight that maj. gen. Lee, seeing the battle going against him, attempted to lead a charge of Early's men in person, and was only restrained from periling his own safety through the earnest remonstrances of his officers, and loud cries from the men of "gen. Lee to the rear!" The battle was not renewed until the 18th, and on the 19th a movement was made to the North Anna, and thence to Cold Harbor and the Chickahominy. A running fight was kept up until June 12th, when Grant made his change of base to the James river, making a march of 55 m. across the peninsula, to a point just below Harrison's landing; Lee's army not interfering with the withdrawal of the union forces from their ill-starred campaign in the wilderness. The two armies during this campaign of 43 days, numbering each about 100,000 men, lost about equally. The design of gen. Grant, however, was foiled by the shrewd maneuvering of Lee, and the fierce fighting of the confederate soldiers. Gen. Hancock, after the wilderness, when asked where the second corps was, answered that "it lay buried between the Rapidan and the James." This was hardly an exaggeration, as that corps alone lost 9,762 men between May 4 and 27. This corps suffered more in proportion than the others, but the entire campaign was a period of frightful slaughter on both sides; and this, though the union advance reached a point within 15 m. of Richmond, without any strategic or other military success to balance it.

WILDEY, THOMAS, 1788-1861, b. England; emigrated to America in 1817, settled in Baltimore, and engaged in the trade of coach-spring making. He was the founder of the American order of odd fellows, and was the grand sire of the first lodge, at Baltimore, 1825-33.

WILEY, ISAAC WILLIAM, D.D., b. Penn., 1825; studied medicine and afterward theology, joining the Methodist Episcopal conference in 1849; missionary to China, 1850-54. After his return was a pastor, 1854-58; principal of the seminary at Pennington, N. J., 1858-64; editor of the *Ladies' Repository*, published at Cincinnati, by the Methodist church, 1864-72; elected bishop, 1872, and now resides at Cincinnati, Ohio. He has published *Fallen Heroes in Foo-Chow*, and *Religion in the Family*.

WILEY, JOHN, b. Long Island, N. Y., 1808; was a clerk in his father's book-store in New York from the age of thirteen for three years; then a clerk in a wholesale dry goods store; was associated in the book-business at one period with A. T. Goodrich, subsequently with George Long; was a partner with George P. Putnam, 1838-48, the firm being engaged chiefly in importing foreign publications, and has since conducted the business in connection with his sons. Mr. Wiley, who is the oldest publisher in New York, now resides in Orange, N. J.

WILFRID, SAINT, an Anglo-Saxon bishop, was born, of noble parents, in the Kingdom of Bernicia in 634. He was remarkable when a boy for his good looks, graceful manners, and ability. He became at 14 the attendant on a Saxon nobleman, who had retired to spend the last years of his life in the monastery of Lindisfarne. There his attention was directed to the controversy as to the time of celebrating easter (q.v.) existing between the two sections into which the Anglo-Saxon Christians were divided; the one advocating the Roman practice, which was that of the continental churches generally, the other adhering to the Scoto-British. Wilfrid resolved to visit Rome to ascertain which was in the right, and thither he went at the age of 19, with recommendations from the courts of Kent and Bernicia. He returned to England a warm partisan of the Roman party. From Alfrid, king of Northumbria, he received a grant of land and a monastery at Ripon, and there, in 664, he was ordained a priest. The synod of Whitby, which met in 664 to discuss the disputed questions between the two parties in the church, was attended by the most distinguished members of both, and among others, by Colman, bishop of Lindisfarne, and Wilfrid. We have a curious account of this conference. The king presided, and seems at first to have been puzzled by the arguments, but he noticed that Colman always referred to St. Columba, Wilfrid to St. Peter—and it struck him that the relative power of these saints had a close connection with the points at issue. "St. Peter," says Wilfrid, "is the rock on which the Lord founded his church, and to him he intrusted the keys of heaven." "Did St. Columba not receive the same power?" asked the king. Colman could not say he had. "Then you both admit that God has given the keys to St. Peter?" Both said they did. "Well," continued the king, "if it is so, I shall not oppose him. Were I to do otherwise, I might find no one to open the gate when I came there; St. Peter might turn his back on me. We must not offend him." The council and audience were carried away by this argument, and the king decided in favor of the Roman party. Wilfrid was afterward named bishop of York, but he did not enter into possession of his see until 669. He then surrounded himself with great pomp, built churches, one of which, at Hexham, was said to be the finest north of the Alps, and strove to oppose the ecclesiastical to the royal power. A quarrel followed with the new king of Northumbria, named Egfrid, and Wilfrid was deposed. He started on a journey to Rome, to make a personal appeal to the pope; but he was driven by a storm to the Coast of Friesland, the inhabitants of which were still pagan. There, however, he was hospitably received by the king. To his arrival the people attributed an excellent fishing season and abundant harvest. He was asked to preach, and he did so in his own Anglo-Saxon tongue, which was perfectly intelligible to the Frisians. Such was the effect, that he baptized many thousands of the people, and all the princes. The event is one of the most memorable in the history of northern Germany and Scandinavia, for with it began the conversion of these countries to Christianity by Anglo-Saxon missionaries, and the introduction into them of the arts and knowledge inherited from ancient civilization (see BONIFACE; WILLIBROD). Wilfrid reached Rome, and the pope decided in his favor; but on his return to England, the king gave no heed to the decree, and committed him to prison. He escaped, however, to the Weald of Sussex, where he converted the pagan inhabitants. He was afterward recalled to his see; and a proposal was made to elevate him to the primacy, but he was still opposed, as the leader of the Roman party, and ultimately he was deposed and excommunicated. He again went to Rome, remained there some years, returned to England in 705, and died at Oundle, in Northampton, in 709.

WILHELMSHAVEN, the chief naval port of Germany, is on the w. side of the entrance of the bay or gulf of Juhde, about 45 m. n.w. of Bremen. The town, first projected in 1856, has been regularly laid out on a strip of ground bought by Prussia from Oldenburg in 1864. It is now a fortress of the first rank, defended by outlying forts and an elaborate system of torpedoedoes; and with its moles, extensive basins, dry docks, vast stores for the navy, and workshops for all the requirements of a fleet, has been a very costly creation—the massive buildings being erected on soft and swampy ground, without any natural advantage save its situation. Water has been obtained by means of artesian wells. A harbor for commercial purposes has been made to the s. of and connected with the naval one: but the mercantile importance of Wilhelmshaven is yet in the future. The pop. in '75 was 10,174. See JADE.

WILHELMSHÖHE. See CASSEL.

WILKES, a co. in n.e. Georgia, having the Broad river for its n. boundary, the Little river on the s.; drained by Fishing creek; 600 sq.m.; pop. '80, 15,985—15,930 of American birth, 10,815 colored. Co. seat, Washington.

WILKES, a co. in n.w. North Carolina, having the Blue ridge on the n. border, drained by the Yadkin, Reddies, and other small streams; 700 sq.m.; pop. '80, 19,181—19,175 of American birth, 1923 colored. Co. seat, Wilkesborough.

WILKES, CHARLES, American naval officer and explorer, was b. in New York in 1801, and entered the navy in 1816, becoming lieut. in 1826. In 1838 he was made commander of an exploring expedition, by which the Samoan and Fiji islands were carefully surveyed, and many other regions of the southern seas examined. In 1842 he

published a *Narrative* of the expedition (5 vols. 1845), for which he received the gold medal of the Royal geographical society. In 1849 he published a volume on *Western America*; and in 1853, on the *Theory of the Winds*. As commander of the U. S. steamer *San Jacinto*, he in 1861 forcibly removed from the British mail-steamer *Trent*, Messrs. Mason and Slidell, commissioners of the confederate states to England and France, and conveyed them to Boston, receiving the thanks of congress, and the acclamations of the people; but, at the demand of the British government, his act was disapproved, and the commissioners restored. In 1862 he was promoted to the rank of commodore, and in 1863 commanded a squadron in the West Indies. In 1866 he was commissioned as rear-admiral on the retired list. He died Feb. 8, 1877.

WILKES, GEORGE, b. N. Y., 1820; in 1858 became co-editor with William T. Porter of the *Spirit of the Times*, a sporting and dramatic paper published in New York, of which he is now proprietor. He published a *History of California* (1845); *Europe in a Hurry* (1852); and a series of Shakespearian papers which appeared in his journal have been republished in book form. In 1870 he received the grand cross of Stanislas from the emperor of Russia for suggesting a railroad to China and India, *via* Russia.

WILKES, JOHN, a celebrated public character, was b. in London, Oct. 17, 1727. His father, a brewer or distiller at Clerkenwell, sent him when a lad to the university of Leyden, where he received an excellent education. On his return to England in 1749 he married a Miss Mead, an heiress, ten years his senior. His good manners, learning, ready wit, and open table secured him many friends, but extravagance and dissipation soon involved him in difficulties. He and his wife separated, and in a lawsuit which followed, facts came out most damaging to his character. He was nevertheless named high sheriff of Buckinghamshire, and in 1757 returned to parliament as member for Aylesbury. In the house he joined in the popular clamor against lord Bute; and in June, 1762, founded a paper entitled the *North Briton*, in which he denounced him with such vigor and success as to drive him from the ministry. He attacked with equal bitterness the next ministry, insinuating that although Mr. Greville was nominally at the head of affairs, lord Bute still had the ear of the king. In the 45th number of the *North Briton*, he charged the king with having uttered a falsehood from the throne, and in consequence, his house was entered, and his papers were seized. He was himself committed to the Tower, on a general warrant. But he was released by chief-justice Pratt, on account of his privilege as a member of parliament. His paper was burned by order of the house of commons; but a riot ensued, showing that public sympathy went with Wilkes. A prosecution was next instituted against the under-secretary of state by Wilkes for the illegal seizure of his papers; and he obtained £1000 damages—a declaration being at the same time made by the chief-justice that general warrants are illegal. Wilkes then went to France, on the plea of bad health, and was expelled from the house of commons. In his absence he was convicted of having printed privately an obscene poem, of which he was one of the authors. It was hoped that evidence of his immoral character would disgust the public with him. But the copy of the book on which the prosecution had been founded had been obtained surreptitiously from a printer employed; and this fact becoming known, the steps taken by the government, instead of injuring Wilkes, only added to the outcry against ministers. On the formation of a new ministry under the duke of Grafton Wilkes returned to England, and becoming a candidate for Middlesex, harangued great crowds in London. After his election he was arrested, in consequence of his outlawry; and on the way to prison he was rescued by a mob. He, however, after it had dispersed, voluntarily gave himself up to justice. When parliament met, a crowd assembled to convoy him to the house of commons. A riot took place, and the military were ordered to fire on the mob in St. George's Fields. Many persons were wounded, and one was killed. The coroner's jury who sat on the body returned a verdict of murder against the magistrate who had given the order to fire; and he was tried for that crime, but acquitted. Wilkes secured a copy of a letter from lord Weymouth to the chairman of the Lambeth quarter sessions in which it was recommended that the military should be employed to suppress disturbances in London. It was published with a preface by Wilkes, in which he charged the secretary of state with having planned "the massacre in St. George's Fields." The house declared the preface to contain a seditious libel, and Wilkes was again expelled. He was after this re-elected several times as member for Middlesex; but the elections were declared void. Col. Luttrell, who vacated his seat and opposed him, obtained only 300 votes; but he was declared to be duly elected, in defiance of a protest from the whole country. Wilkes, still in prison, was now recognized as the champion of public liberty, and became the most popular man in England. In 1769 he obtained a verdict against lord Halifax in the court of common pleas, with £4,000 damages. He was shortly after discharged from prison on giving a bond for good behavior during seven years. In 1774 he was chosen lord mayor of London, and again returned for Middlesex, which he continued to represent for many years. In 1782 the resolution by which he had been declared incapable of re-election was expunged from the minutes of the house of commons, as subversive of constitutional rights. The other resolutions relating to Wilkes were at the same time expunged. Two years later he withdrew from the house of commons. He died Dec. 27, 1797.

WILKESBARRE, a city in Pennsylvania, the co. seat of Luzerne co., on the left bank of the n. branch of the Susquehanna river, and on the Lehigh and Susquehanna, the Delaware, Lackawanna and Western, and the Lehigh Valley railroads; pop. '80, 23,339. It is near the center of the famous Wyoming valley, and the beautiful scenery around it attracts many visitors in the summer. Horse railroads are on the streets, which are lighted with gas. The court-house, a fine building in the Romanesque style, stands in the center of the city, where the chief business streets cross at a diamond-shaped square. The city contains banks, a county prison built of stone at a cost of \$200,000, a city hospital, a home for friendless children, a seminary for girls, and a public library. Nine newspapers are published, of which two are dailies and two German. The rooms of the historical society contain collections of antiquities, and specimens in natural history, etc. The city is the home of a cultivated society. The great deposits of anthracite coal around Wilkesbarre have built it up. Anthracite coal had been taken out before the revolution. The Red-ash mine was opened in 1807. The production for the last 30 years has been enormous. There are 8 great mining companies, with an annual capacity of 4,500,000 tons, and employing over 12,000 persons. The so-called "mammoth vein" is 29½ ft. thick. Some of the richer Wyoming veins average 80 feet. The whole n. field in the Lackawanna and Susquehanna valleys is supposed to contain over 2,000,000,000 tons. The city, which was founded in 1772 and became a city in 1871, was named in honor of John Wilkes and col. Barre for their advocacy of the rights of the colonists.

WILKIN, a co. in w. Minnesota, bounded by the Red and Bois de Sioux rivers, which separate it from Dakota; 900 sq.m. pop. '80, 1906—1261 of American birth. Co. seat, Breckenridge.

WILKIE, Sir DAVID, a distinguished Scottish painter, was b. in Fifeshire, at Cults, of which parish his father was minister, Nov. 18, 1785. His boyish passion for art was too strong to be resisted by his father, who, with much reluctance, sent him in 1799 to study in the academy of Edinburgh. Here he greatly distinguished himself; and returning home, in 1804, he painted his "Pitlessie Fair," a piece in which already his peculiar genius is pronounced, and which brought him the sum of £25. The price seems paltry; but for the work of an unknown country stripling in an original walk of art, it was perhaps to be considered handsome. Shortly after, Wilkie proceeded to London, intending to return to Scotland after a year or two of study; but the great success of his picture, "The Village Politicians," determined him to settle in the metropolis. Not that pecuniarily, he was very greatly benefited, £30 being all that the earl of Mansfield could with difficulty be got to pay for the picture, though aware that, on a point of honorable scruple, the artist had refused repeated offers of £100; but the originality and humor of the work greatly captivated the public, and at once established the reputation of the painter, who had soon commissions in plenty, at greatly advanced prices. In 1809 his brethren of the Royal academy ratified the favorable verdict of the public by electing him an associate; and two years afterward he was advanced to the rank of academicians. In 1814 in company with his friend Haydon, he visited Paris, and inspected with great delight the art-treasures at the Louvre. Though his father had died some years before, and his mother and sister were now living with him at Kensington, in 1817 he made a run into Scotland, and, while the guest of Scott at Abbotsford, painted his well-known picture of the great poet and his family. During these years, Wilkie had been engaged on the series of pictures on which mainly his fame rests; pictures familiar by engraving to every one (the "Blind Fiddler," "Card Players," "Rent Day," "Jew's Harp," "Village Festival," "Blind Man's Buff," "Distraint for Rent," "The Penny Wedding," "Reading of the Will," etc.), in which the homely humors of humble life are expressed by a vehicle appropriately simple, and—though scarce in the higher sense to be called color—of charming purity and transparency. In this style, distinctively his own, his genius is commonly held to have culminated in "The Chelsea Pensioners listening to the News of Waterloo," which was painted during the years 1820-21. This work was a commission from the duke of Wellington, who paid the artist 1200 guineas for it. Subsequently, he changed his style, sought to emulate the depth and richness of coloring of the old masters, and deserting the homely life, which he could treat so exquisitely, chose elevated, and even heroic subjects, to the height of which he could never rightly raise himself. The florid picture, painted in 1820, of "George IV. entering Holyrood," which, though not without its fine points, can delight no one but a flunkey, gave the first hint of the change; and no doubt a tour over nearly the whole continent, which he made for his health, in 1824, everywhere, of course, intent upon the grand old masterpieces, did something to stimulate the new and unwise ambition. By common consent it has been adjudged unwise; and Wilkie remains, and will remain, memorable, not for the quasi-high art of his later years, but for the simpler, truer, and, in every right sense, higher art of his earlier time. He never, however, ceased to be popular, and honors continued to be showered upon him. On the death of sir Henry Raeburn, he succeeded him as limner to his majesty; in 1830 he was made painter in ordinary to his majesty, in room of sir Thomas Lawrence deceased; and in 1836 the honor of knighthood was conferred upon him. Wilkie had never been robust; and his health now began to give way seriously. In 1840, seeking to re-establish it, he

once more left England; but he did not find what he sought. Having visited Syria, Palestine, and Egypt, he died on his voyage home, off Gibraltar, and his body was committed to the deep.

As an illustrator of Scottish character and manners in humble life, Wilkie, in his best pictures, may take rank with Burns in poetry, and Scott in fiction. As a man, he was kindly, warm-hearted, and of essential generosity of disposition.—See *Life and Letters of Wilkie*, by Allan Cunningham (1843).

WILKINS, Sir CHARLES, D.C.L. 1749–1836; b. England; went to Calcutta in the service of the East India company, 1870; remained several years and acquired a thorough knowledge of Bengali, Arabic, Persian, and Sanskrit. He made type for printing Halded's Bengali grammar, and matrices for the font of Persian type. He translated the *Bhagavat Gita* and *Hitopadesa*. Returning to England, 1786, he was appointed librarian of the East India company, 1800; was knighted 1823. He published a *Grammar of the Sanskrit Language*; *The Roots of the Sanskrit Language*; edited Richardson's *Arabic and Persian Dictionary*, 2 vols.

WILKINS, JOHN, D.D., 1614–72; b. England; graduated at Oxford, 1632; took orders 1635; was chaplain to lord Say and Charles, count palatine of the Rhine; during the civil war, adhered to the parliament; was made warden of Wadham college, 1648; married the sister of Oliver Cromwell; appointed by Richard Cromwell master of Trinity college, 1659, and ejected at the restoration, 1660; having obtained favor with Charles II., was made prebendary of York, 1660; rector of St. Lawrence, London, 1662; and bishop of Chester, 1668. Among his published writings were treatises on *The Moon a Habitable World*; *The Earth probably one of the Planets*; *The Gift of Preaching*, and *The Beauty of Providence*.

WILKINSON, a co. in central Georgia bounded n. by the Oconee river; 430 sq. m.; pop. '80, 12,061—12,044 of American birth, 5,510 colored. Sulphur springs are found. Co. seat, Irwinton.

WILKINSON, a co. in extreme s.w. Mississippi, bordering on Louisiana; 580 sq. m.; pop. '80, 17,815—17,650 of American birth, 14,246 colored. Co. seat, Woodville.

WILKINSON, Sir JOHN GARDNER, a distinguished traveler and archaeologist, was the son of the late rev. John Wilkinson, of Hardendale, in Westmoreland, and was born on the 5th of October, 1797. Having lost both his parents at an early age he was left under the guardianship of the rev. Dr. Yates, by whom he was sent to Harrow school in 1813, and to Exeter college, Oxford, three years later. While a boy, young Wilkinson had a strong desire to enter the navy, principally with a view to seeing foreign countries. He also in early life showed a great fondness for architecture and sculpture. While at Harrow he made sketches of all the churches within a radius of some miles from the school; and, while at Oxford, often employed himself in drawing from the objects contained in the Arundel collection. He still further cultivated his taste for architectural antiquities by trips on the continent, made during his college vacations. On taking his B.A. degree he resolved upon making a wider tour on the continent. While in Italy he became acquainted with sir W. Gell, who, perceiving his taste for archaeological research, strongly urged him to make an extensive survey of the remains of Egyptian civilization; and in Oct., 1821, he set out for Alexandria, as a starting-point for his explorations. He took up his abode at Cairo, where he learned Arabic, both to read and speak; he also studied Coptic. Making Cairo his headquarters he now traveled through and investigated almost every part of Egypt and Lower Nubia. Twice he ascended the Nile as far as the second cataract, and several times as far as Thebes. At the latter famous site he spent more than twelve months in making explorations; he also visited the deserts on either side of the river, and the Egyptian oases. During subsequent visits he completed the exploration of those deserts, and, in fact, made a complete survey of Egypt, on a scale of about 10 in. to a degree, which unfortunately, for the interests of science, has not yet been published. The same might have been the case with his *Survey of Thebes*, had not the author engraved and published it at his own expense. As a result of his first visit to Egypt, Wilkinson transmitted to the British museum more than 300 antiquarian objects, besides numerous specimens of natural history. Wilkinson's first residence in Egypt extended over a period of twelve years, during which time he composed and published his first two works on Egyptian subjects—viz., *Materia Hieroglyphica; containing the Egyptian Pantheon and the Succession of the Pharaohs, from the Earliest Times to the Conquest by Alexander, and other Hieroglyphical Subjects: with Plates and Notes explanatory of the same*. The preface to this work is dated "Pyramids of Geezeh, July, 1828;" but it was printed and revised for the author at Malta in the same year. This work was followed by *Extracts from several Hieroglyphical Subjects, found at Thebes and other parts of Egypt, with Remarks on the same*—also printed at Malta in 1830, but with a dedication to sir W. Gell, dated "Thebes, 1827." In the same year (1830), he published his *Topographical Survey of Thebes, Tapé, Thaba, or Diospolis Magna*, in six sheets. In 1833, Wilkinson, in consequence of ill health, was obliged to return to England. In 1835 he published *Topography of Thebes, and General View of Egypt* (Lond. John Murray). This was followed in 1837 by *Manners and Customs of the Ancient Egypt*.

tians, including their *Private Life, Government, Laws, Arts, Manufactures, Religion, and Early History*; derived from a Comparison of the *Paintings, Sculptures, and Monuments still existing with the Accounts of Ancient Authors: illustrated by drawings of those Subjects* (3 vols. Lond. John Murray). This work at once obtained great popularity, both from the extent and soundness of its information, and the agreeable style in which it was written. It was highly spoken of by the critics; and obtained for him also the honor of knighthood, with which he was invested in 1839. Many things of importance were, however, omitted in it, which he afterward published in *A Second Series of the Manners and Customs of the Ancient Egyptians, including their Religion, Agriculture, etc.* (2 vols. and a volume of plates, Lond. Murray, 1841). Wilkinson again visited Egypt in 1841 and in 1843. He also visited Syria, Constantinople, Tunis, and Sicily, returning to England after an absence of two years, by the Illyrian coast of the Adriatic. During his two years' absence he also visited Dalmatia and Montenegro, which gave occasion to the publication of his *Dalmatia and Montenegro, with a Journey to Mostar, in Herzegovina, and Remarks on the Slavonic Nations; the History of Dalmatia and Ragusa, the Uscoos, etc.* (2 vols., Lond. Murray). Wilkinson's other works are—*Modern Egypt and Thebes; being a Description of Egypt, including the Information required for Travelers in that Country; with Wood-cuts and a Map* (2 vols., Lond. Murray, 1843); *Hand-book for Travelers in Egypt; new edition condensed of Modern Egypt and Thebes* (Lond. 1847, and again in 1858); *The Architecture of Ancient Egypt, with a Large Volume of Plates Illustrative of the Subject* (Lond. 1850); *The Fragments of the Hieratic Papyrus at Turin, containing the Names of Egyptian Kings, with the Hieratic Inscription at the back* (Lond. 1851); *A Popular Account of the Ancient Egyptians, revised and abridged from his larger Work* (Lond. 1854); *The Egyptians in the Time of the Pharaohs*; to which is added an *Introduction to the Study of Egyptian Hieroglyphs*, by S. Birch (Lond. 1857), published as a companion to the Crystal palace guides; *On Color, and on the Necessity for a General Diffusion of Taste among all Classes; with Remarks on laying out Geometrical Gardens, illustrated by Colored Plates* (Lond. 1858). Wilkinson also contributed notes to the rev. G. Rawlinson's edition of *Herodotus*. In 1848 he paid a fourth visit to Egypt, and a fifth in 1855, when, he was drawing at Thebes under excessive heat, he received a *coup de soleil*, which compelled him to return home. There Wilkinson occupied himself in examining ancient British remains in England and Wales. In 1874 he presented to the governors of Harrow school his collection of coins, about 1000 in number, having previously given to the same body his large collection of Egyptian, Greek, and other antiquities, for the purpose of founding a museum at the school. His death took place in 1875.

WILKINSON, JAMES, 1757-1825; b. Md.; served under Arnold in the n., was at Trenton and Princeton, and was appointed by Gates adj.gen. in 1777. In 1778 he became secretary of the board of war presided over by Gates. He resigned in 1779 in consequence of a quarrel with Gates, but was soon appointed clothier-gen. of the army. After the war he removed to Kentucky. In 1791 he was appointed to the U. S. infantry, and led an expedition against the Wabash Indians. He commanded Wayne's right at Maumee Rapids, and was appointed gen.-in-chief in 1796. He was governor of Louisiana, 1805-6; given command along the Mississippi in 1808; three years later he was court-martialed, but acquitted of complicity with Aaron Burr, and of being in the pay of Spain. In 1813 he was made maj.gen., and sent north. His campaign was unsuccessful, mainly on account of Hampton's disagreement with him, and he was superseded. A court of inquiry exonerated him in 1815. The same year he was discharged from the army then being reorganized. The rest of his life was spent in Mexico. He wrote *Memoirs of My Own Times*.

WILKINSON, JEMIMA, 1753-1819; b. R. I.; educated in the society of Friends; when 20 years, old after an apparent suspension of life, from the effect of severe fever, she recovered, and asserted that she had been raised from the dead to instruct the living; professed to work miracles; and had a few followers who with her built in Yates co., N. Y., a village named Jerusalem. At her death the sect was broken up.

WILL. The mind is divided into three distinct functions—feeling (see EMOTION), intellect or thought (see INTELLECT), and will or volition. Under will, is included the putting forth of active energy to move our own organs, or change something about us, but all energy is not voluntary energy. The peculiarity of action from will, in contrast to other activities, as the powers of nature—wind, gravity, etc., is its being preceded or inspired by feelings, or by the pleasures and pains of an individual mind. Hence, will is defined, *action prompted by feeling*. The feelings that prompt the will, called motives, are our pleasures and our pains; pleasure felt or imagined moves us to continue and increase the pleasurable state; pain urges us to work for the abatement of the pained condition.

In the maturity of the powers, a human being, or animal, can perform a great variety of specific actions at the bidding of the various wants or desires. The sensation of thirst induces at once a series of complicated movements, ending in the relief of the painful feeling. But no man or animal is born with the ability to make a journey to a well, whenever thirst is felt; the human infant cannot even perform the voluntary act of lifting anything to its mouth. Our most ordinary voluntary movements are the result of an education; and the explanation of the volitional energies consists in ascertaining what

are their beginnings or germs in the mental constitution, and how they are brought to the finished state.

Three different facts of our nature appear to concur in forming the collective aptitudes of the will:

I. The fact termed spontaneous activity, or the self-acting energy of the system, whereby movements arise without waiting the stimulus of the senses. Any actively disposed animal, after rest and nourishment, begins to move merely through a surplus of nervous power, and not because it is wakened out of dormancy by the solicitations of sensible objects. Without this tendency to commence movements in the first instance, there would be no apparent basis for the voluntary acquirements. See SPONTANEITY. In imitation with the voice, for example, we must begin by uttering sounds, and then discover by the ear their agreement or disagreement with the sounds heard.

II. The second fact is the tendency to abide by a movement giving pleasure, and to relax a movement coincident with pain. From the first moments of sentient life, every animal appears to possess this property. If a movement happens to coincide with an access of pleasurable warmth, the animal maintains, and possibly increases, the movement: if the warmth passes into pain, the movement ceases. The infant sucks so long as the feeling is pleasurable, and ceases when satiety comes on. This power may be an offshoot of the general law connecting pleasure with an increase, and pain with a diminution of vital energy. See EMOTION. However arising, the fact is unquestionable, and is exemplified all through life. Without our going through any process of deliberation or resolution, we sustain an activity that brings us agreeable sensation, and remit an activity ending in pain. We keep our eyes fixed on a cheerful flame, and withdraw them when the glare is overpowering; the process is self-acting and intuitive.

III. The third fact is the operation of the retentive power of the mind, in joining together, by a permanent association, movements and feelings that have existed together for some time. This is a branch of the great law of contiguous association. See ASSOCIATION OF IDEAS. The will is an educated function, and education supposes the plastic or fixing operation expressed by the above-named law.

But the chief nicety in explaining the growth of the will consists in showing how the proper movements and feelings originally came together. This is the problem of the development of voluntary power, which would demand an extended illustration. A brief indication of the process must suffice.

One of the easiest examples is the moving of the head to follow a light or other object pleasing to the gaze. This power is not possessed at the commencement of life, and the process of arriving at it is supposed to be as follows: The child has its eyes fixed on the light, and enjoys the luminous excitement. The light is moved to one side, and is therefore lost to the direct gaze, and there is no power to recover it. An accidental movement of the head, occurring by mere spontaneity, carries the eyes round to encounter the light again, or to follow it as it moves; the consequence is, that the recovered pleasure of the spectacle sustains the movement that brings it. Now, every such coincidence tends to become fixed, by the law of plastic association; and after a few repetitions of the accidental concurrence, there is a connection formed between the optical impression and the movement that is found to go along with and sustain it. Thus it is, that a movement of the object to the right hand, which leaves a characteristic trace on the visual organ, becomes associated with a movement of the eyes and the head to the right hand; and whenever the optical fact arises, the movement is apt to follow. This makes one distinct item in our volitional acquisitions; one instance of the power of definitely acting to a definite feeling.

Another example might be taken from the feelings of warmth and chillness—both very powerful sensations in all animals. One of the most obvious means of attaining comfortable warmth is to crouch and bring all the limbs close to the body. A very early experience would connect this posture, accidentally hit upon, with the comfortable sensation; and, by virtue of the primary law of the mind, connecting pleasure with exalted energy, the movement, once coinciding with the pleasure, would be sustained and adhered to, so long as it brought the pleasure; and in course of a few repetitions, a definite association would be formed between the state of chillness and this mode of relieving it. By a more lengthened and round-about process, more complicated associations would be formed, such as coming close to the warm body of a companion, running into shelter, approaching a fire, going into the sunshine, etc.; but, in all cases, the only mode of attainment that can be pointed out, is (1) the concurrence of spontaneous movements with feelings of pleasure, or relief from pain; (2) the maintenance of those movements by the first law of self-conservation; and (3) the forming of a link between the two by the force of plastic association.

The illustration may be varied by viewing the case from the side of pain. The immediate and direct result of pain, from the dawn of sentient life, is to lower active energy for the time, and therefore to arrest whatever movements are in progress; this is the general rule, although there is an important exception in the case of acute or pungent pains, which, in the first stage, stimulate and excite the active members. Hence, when a movement happens to coincide with a pain, it is liable to be arrested; a bitter morsel in the mouth makes one cease chewing, by reducing the active power for the moment. The primitive endowment of the system would lead to nothing further, until some chance

movement of the mouth tended to get rid of it, which movement would be promoted and sustained by the pleasurable feeling of relief, which is the operation of the principle from the other side.

The growth of the will is conspicuously shown in imitation, which is an acquired aptitude, and a department of our voluntary power. In imitation there must be (1) a spontaneous tendency to move the active organs concerned—the voice, the mouth, the hands, etc.; (2) a sense of the effect, with a certain pleasure in attaining it; and (3) a cementing process, as already described. In learning to speak, the infant must first articulate something of its own accord; the resulting sound affects its own ear, and is discovered to coincide with a sound heard from others. The frequent repetition of the articulate effort leads to its being coupled in the mind with the sound that it gives; and when this association is mature, the sound heard will induce the articulating movement; and this is the power of imitation. But previous to the opportunity of associating the exertion of the mouth, throat, and lungs with the sound emitted, there does not appear to be any capability to imitate articulate sounds. The same would apply to imitation by the hands.

The will in its full development includes not merely a series of associations of movements with the ordinary pleasures and pains, but also the power of performing actions to the word of command, the imitative faculty just discussed, and the power of acting from a mere wish to perform a certain action, or to produce a certain effect upon things about us—as to open a window or stir the fire. It might be shown that all these various aptitudes grow, by successive stages, out of the three fundamental facts above described. The process involves many struggles and failures, from there being so much in it depending on accidental commencements; hence one reason of the slowness of the early education of human beings.—See Bain on *The Emotions and the Will*. See also FREE-WILL.

WILL is, in English law, a writing by which a person entitled to property declares what is to be done with such property after his death. Though, by the Wills act, 1 Vict. c. 26, a writing is indispensable to a will, yet there is an exception in the case of soldiers or sailors who, from their occupation, and while in actual service, are allowed to make a verbal or nuncupative will; and this exception only extends to their personal estate, for they must make a written will, like other persons, in order to deal with their real estate. An infant or person under 21 years of age, cannot, since 1838, make a will. A married woman can only make a will if she has separate property, or her husband assents to her will, or she makes the will by virtue of some power of appointment vested in her. As a general rule, it is absolutely necessary that the party making a will should have a free and disposing mind at the time; and hence, if he or she is a lunatic, or drunk, or acting under compulsion, fear, or undue influence, the will is invalid. There is no limit as to the time preceding death when a will may be made; it is enough that the testator was at the time capable and sensible, though he died immediately after. A will must be executed in presence of two witnesses, who see the testator sign the will, or at least hear him acknowledge it. But there is no particular form of words in which a will must be made for the purpose of disposing either of realty or personality. The will must be in writing, but it need not be in ink or written continuously. The testator may sign by his mark or by an assumed name. Though a seal is not equivalent to signature, yet a person may have a stamp to sign papers with, and that will be sufficient for a will also. The testator need not sign the will if he authorize some one to do so for him in his presence. The signature must be at the foot or end of the will; but if it is placed so as to lead a court to the conclusion that it was intended to give effect to the will, that will be enough. Though the witnesses need not know it is a will, they must be present together when the testator signs it or acknowledges his signature. The witnesses must sign their names or make their marks. A legatee, or the wife or husband of a legatee, may be an attesting witness, but by being so, he or she will forfeit any legacy left to him or her by the will. But one may be an executor though he attests the will. A will is revoked by the marriage of the testator or testatrix. The mere fact of making a subsequent will does not of itself operate to revoke a prior will, unless there is some inconsistency in whole or in part; and, as a general rule, no will will be revoked by any presumption of an intention on the ground of an alteration in circumstances. The usual way of revoking a will is to burn, tear, or destroy it with the intention of revoking the same; or by executing another will which expressly revokes the prior will. When a testator tears or cuts away that portion of his will containing the signature and attestations, the presumption is that he intended to revoke the whole. But merely cutting out a part of the will, or striking it through with a pen, does not amount to a revocation. It is to be borne in mind that, in order to revoke by tearing, etc., there must be an intention to revoke, so that a mere accidental tearing will prevent the act from having the force of revocation. When there are interlineations or alterations in a will, it is presumed these are made after signature, unless there is evidence to prove the contrary. A will which is in any manner revoked can only be revived by re-execution, or by a codicil showing an intention to revive it; but many nice questions have arisen as to what causes a will to revive.—In Scotland a will is used only to denote a testament affecting personal or movable property; while a will affecting real or heritable property can only be made by way of a deed having a present operation. A will

or testament may be written in the hand-writing of the testator, and if signed by him, will not require witnesses, being then called a holograph will. In other respects, wills are subject to nearly the same rules which prevail in England with respect to revocation, etc. Wills of real property are called dispositions or deeds, and have a present operation, and the mode in which they are drawn up is that of conveying the property to the donee, but reserving the testator's life-rent. The effect of this is that the testator retains the property in his own hands while he lives; but the moment he dies, the disposition *mortis causa* comes into play, and the donee then takes the property, subject to the deed. See DEED.

WILL (ante). In the United States the law in regard to the making, attestation, and probate of wills is governed by the statutes of the different states, which, though they disagree in many particulars, are in most points governed by the common law principles above enunciated. Nuncupative wills are regarded with distrust, and the making of them closely restricted by statute. The English statute making the will of any person under 21 invalid has been adopted in many states. The rights of married women in regard to wills have been greatly extended in most states; though the harsh common law doctrine that a *femme covert* can make no will without the husband's consent is retained in a few. Monomania may or may not be a disability, according as the nature of the delusion does or does not affect the testator's capacity to judge sanely in regard to the disposition of his property. The law is far less stringent as to the wording than as to the execution and attestation of a will. The language may be both informal and ungrammatical; it is enough that it expresses the intention clearly. But the attestation must be precise. Two usually, sometimes three, witnesses are necessary. In a few states a *holograph* of personalty need not be attested. The provisions of the statute of frauds in regard to wills are in force in all the states. Implied revocation is, therefore, in most cases barred, nor can courts of equity reform a will upon proof of *mistake* as in the case of contracts. The common law rule that marriage and the birth of a child after the execution of a will was a revocation is sustained in most states, but with some limitations. It is not necessary that there should be witnesses to the voluntary canceling, burning, or destroying of a will by the testator. The republication of a will occurs where a will has been formally revoked but not destroyed, and has again been made valid by a second attestation. Though the will dates from the death of the testator, the language must often be construed in reference to the time of execution. The method of proving wills is described under PROBATE COURT.

WILL, a co. in n.e. Illinois, adjoining Indiana; about 825 sq.m.; pop. '80, 53,431—37,256 of American birth. Bituminous coal is found. Co. seat, Joliet.

WILLAMETTE RIVER, a river in Oregon, rising in the Cascade mountains, and flowing n.w. and n. until it empties into the Columbia river. On its banks are Portland and Oregon City. It is always navigable as far as Portland, and by means of locks and a canal at Willamette Falls, 23 m. from its mouth, small steamboats can for the greater part of the year reach Eugene City, 130 m. from the mouth of the river.

WILLARD, EMMA C. (HART), 1787-1870; b. Conn.; taught a district school at the age of 16; was a teacher at Middlebury, Vt.; married there Dr. John Willard, 1809, and opened a boarding school for girls; submitted plans for a higher seminary to gov. Clinton of New York, and with his approval opened one at Waterford, 1819, removing it to Troy, 1821, and conducting it with great success till 1838, when she resigned it to her son and settled at Hartford, Conn., devoting herself to the improvement of her numerous school books and to public labors for the promotion of education.

WILLARD, ERASTUS, 1800-71; b. Mass.; graduated Waterville college, Me., 1824; studied theology at Newton theological seminary; was pastor of a Baptist church, Grafton, Vt., 1833; went to France, 1835, and instructed candidates for the ministry; returned 1856, and was a missionary among the Ottawa Indians, 1856-59; settled at Salem, N. Y., 1859-65, and afterward at Newport, R. I.

WILLARD, FRANCES E., b. N. Y., 1839; graduated at North-western female college, 1858; taught in various western towns; was principal of the Genesee Wesleyan seminary, Lima, N. Y., 1867; elected president of the Evanston college for women; connected with the North-western university, Chicago, 1871; traveled extensively in Europe, Palestine, and Egypt, 1869-71; lectured successfully in Chicago on the *New Chivalry*. Besides numerous articles to periodicals, she published *Nineteen Beautiful Years*, a biographical sketch of a sister.

WILLARD, JOSEPH, D.D., LL.D., 1738-1804; a great-grandson of president Samuel; b. Me.; went to sea in early youth; graduated at Harvard college, 1765; tutor there, 1766-72; became colleague pastor of the Congregational church at Beverly, Mass., 1772; and president of Harvard college, 1781-1804. Among his published writings are several sermons; a Latin address on the death of Washington; and scientific papers in the *Memoirs of the American Academy* and the *Philosophical Transactions*. He was also a good Greek scholar, and left an unpublished grammar of the language.

WILLARD, SAMUEL, 1640-1707; b. Mass.; graduated Harvard college, 1659; minister of Groton, 1663-76, whence he was driven during king Philip's war; colleague with the rev. Thomas Thatcher of old South church, Boston, 1678, and afterward his suc-

cessor; vice-president and acting president of Harvard college, 1701, until his death. He opposed the proceedings of the court during the witchcraft prosecutions. He published *Brief Animadversions; The Fountain Opened*. A posthumous folio volume was published entitled, *A Complete Body of Divinity*, consisting of lectures given for 19 years.

WILLARD, SIMON, 1605-76; b. England; came to America in 1634; and was the founder of Concord, Mass., and a resident of Groton, Salem, and Charlestown, where he was a magistrate. In king Philip's war he served as major of the militia.

WILLCOX, ORLANDO BOLIVAR, b. Mich., 1823; graduated at West Point, 1847, and was commissioned in the artillery. He served in Texas and Florida; resigned, 1857, and practiced law until 1861, when he became col. of the 1st Michigan volunteers, the first western regiment at the front. He joined with Ellsworth in taking possession of Alexandria; took part in Bull Run, Antietam, Fredericksburg, the Tennessee and Richmond campaigns, and distinguished himself at Spottsylvania and Petersburg. He left the army with the brevet rank of maj.gen. Under the pseudonym of "Major March" he wrote *Shoepiek Recollections* and other books.

WILLEMS, FLORENT, b. Belgium, 1812; studied art at Mechlin and at Paris, where he settled in 1839. He ranks high among the *genre* painters of that city. Among his best pictures are: "Une Partie du Music," "Visite de Marie de Médicis à Rubens," "Au Roi!" and "La Sortie."

WILLEMS, JAN FRANZ, a distinguished Flemish philologist and writer, and noted as one of the originators of the great Flemish national movement, was b. in 1793, at the little village of Bouchout, near Antwerp. Willems, at the age of twelve, was sent to the town of Lierre, to learn singing and music, for which he had early evinced considerable aptitude. At Lierre, which continued to be the seat of some of those ancient Belgian literary associations known as "Rederyk-Kamers," or chambers of rhetoric, mysteries and other scenic representations were given from time to time in connection with these institutions; and during Willems's residence in the town he was frequently called upon to take part in these singular entertainments, a circumstance to which he ascribed his first impulse toward the study and cultivation of the old Flemish language and literature. The talents which he exhibited in his acting, and in the composition of satirical verses, attracted the notice of several influential persons at Lierre, through whose agency he was sent to Antwerp, to study in the office of a notary; and in 1811 he contended successfully for the prize awarded for the best poem on the battle of Friedland and the peace of Tilsit. From this period his poetical and dramatic compositions followed each other in rapid succession. His ode *Aen de Belgen* (To the Belgians), which appeared in 1818, in which he exhorted his countrymen to resume the use of their native Flemish, and his clever treatise on *De Nederduytsche Taal en Letterkunde* (1819-24), in which he traced the history of the Flemish and Dutch tongues from their common origin to their gradual but slight divergencies, marks an epoch in the literary history of Belgium. The Dutch government showed their sense of his anti-French tendencies by giving him the post of keeper of the archives at Antwerp, while the royal institute at Amsterdam elected him a member of its learned corporation; but the Catholic party in Belgium, resenting the attempt made by Willems to refer the decline of Belgian national renown to the abandonment of the Flemish vernacular, looked upon his writings with mistrust; and in 1830, when Belgium was definitely separated from Holland, the dominant Belgian party deprived Willems of his office, and left him for a time in obscurity and neglect. In 1835, chiefly through the influence of his old opponent, S. Van de Weyer, he was, however, promoted to the place of keeper of the archives at Ghent, where he continued to reside in the enjoyment of numerous literary successes and national honors till the period of his death, which took place in 1846. Willems had the satisfaction, during the latter years of his life, of seeing the gradual growth of the Flemish movement, which, since his death, has continued to advance with steady progress, and has resulted in the formation of many literary societies, the publication of numerous literary and historical remains of the old Flemish, and a more general cultivation of the vernacular. Among the numerous Flemish works published by Willems, special notice is due to his version of the mediæval poem of *Reincke Vos* or *Reynard the Fox*, for which he claims a Flemish origin; while, among the more important of his strictly national works, we may instance his editions of the rhymed chronicles of Jan de Klerk and Jan van Heelu, and his *Moeijeligen van Vaderlandschen Inhoud*.

WILLEMSTAD, a fortified t. in North Brabant, on the Hollandsdiep, 19 m. n.w. of Breda, erected by William I., prince of Orange, to protect the traffic between Holland and Zeeland. There are 7 bastions, 2 forts, 2 inundation sluices, and a good haven. Pop. '70, 1826; '76, 2,009. In 1793, baron van Boetzelaar successfully defended Willemstad against the French, under Dumouriez, who, after a heavy bombardment, were obliged to break up the siege. It was the birthplace of the naval hero, Callenberg, who, when De Ruyter fell in action with the French, succeeded to the command.

WILLEMSTADT, chief t. of the island of Curaçao (q.v.).

WILET, *Symphema semipalmata*, a bird of the family *scelopacidae*, a native both of North and South America. It is about 15 in. long; dark ash-color above; the

rump, upper tail coverts, and under parts white, the tail grayish, the tail-feathers, all except the two middle feathers, spotted with dark-grayish brown; the secondaries of the wings white, with dark-brown spots. The bill is two inches and a half in length, very thick, compressed; the wings long; the legs long and strong, the tail short and nearly square; the toes partially webbed. This bird is found in summer as far north as the coasts of New England; in winter, it retreats to the gulf states. The flesh is highly esteemed, and the eggs are reckoned a delicacy. Willets are usually seen in flocks, and generally near the sea. The name is derived from the note.

WILLET, THOMAS, 1610-74; b. England; a merchant in the Plymouth colony, who removed to New York when it passed into the hands of the English. He was the first mayor of that city. He afterward removed to Seekonk, Mass., where he died.

WILLETT, MARINUS, 1740-1830; b. N. Y.; a lieutenant in Delancey's regiment in the French wars. He was at the attack upon Ticonderoga, and went with Bradstreet's expedition against fort Frontenac. He accompanied Montgomery in his Canada campaign, and in 1777 defended fort Stanwix against a mixed force under St. Leger, and held out till Arnold came to his assistance. After the war he settled in New York, of which he was sheriff, 1784-92, and mayor in 1807.

WILLEY, HENRY, b. N. Y., 1824; educated at the Bridgewater, Mass., normal school. He has given considerable attention to botany, and especially to the study of the North American lichens. Among his works are *List of North American Lichens* (1873), and numerous papers on lichens, contributed to scientific journals or transactions. He has edited the *New Bedford Evening Standard* since 1856.

WILLIAM I., King of England, commonly called *William the Conqueror*, was the illegitimate son of Robert, surnamed *Le Diable*, duke of Normandy. He was born in 1027, and succeeded to the dukedom on the death of his father, in 1035. Previous to his father's death, he had been intrusted to the care of Henry I. of France; but it was owing rather to the quarrels and jealousies of his own subjects than to the protection of Henry, that he was able to preserve his dominion intact, until his arrival at manhood. In 1047 he gained a victory at Val de Dunes over a powerful competitor, Guido of Macon; and in 1054 he defeated another rival, Guillaume, count of Arques, being aided in both contests by the French. His ambition now began to extend to England, where Edward the confessor reigned at this time. On visiting England, William found his hopes of succeeding Edward much strengthened by the dominance of Norman influence in the councils of that monarch. On Edward's death, however, the Witenagemote (q.v.) chose Harold (q.v.) to fill the English throne; ignoring, according to the monkish chroniclers of Norman bias, in so doing, an alleged bequest of Edward in favor of William. The Norman asserted his pretended rights by a powerful invasion, and the result was his acquisition of the crown by the famous battle of Hastings, Oct. 14, 1066. Harold having been killed in the fight, the Saxons chose Edgar Atheling as his successor. Edgar was however, was soon obliged to yield, and William was crowned king of England, Dec. 25, 1066; from which day his reign is dated. Edgar remained for some time at his court, and his treatment of the conquered people was at first mild and conciliatory; but his savage suppression of a rebellion, which broke out in the n. in 1070, laid the foundation of an irreconcilable antipathy between Saxon and Norman, which rendered a continuance of this policy impossible. Before long, William began to rule like a true conqueror. Everywhere, the Saxons were reduced almost to a state of slavery. The higher classes were deprived of every office of church and state, while the people were ground down by new and oppressive taxes. Fortresses were erected over the country, and garrisoned to overawe the Saxon inhabitants. In 1072 the Saxons were so far reduced to submission that William found time to lead an army across the border into Scotland, in order to punish the king of that country Malcolm Canmore, for having received and protected Edgar Atheling. The conqueror marched as far n. as the Tay, and received a nominal submission from Malcolm. In 1085 an attempt was made to overturn the power of the English king by Canute, king of Denmark. A great naval armament was got together for the purpose of invasion, but the enterprise was abandoned, its abandonment being caused partly by bad luck, and partly, it is supposed, by a skillful application of William's treasure. The tax called the *Danegelt* (q.v.) was reimposed to meet the expense caused by the threatened war. Disputes having arisen between William and his son Robert respecting the duchy of Maine, which had come to William through his marriage, Nov. 2, 1053, with Matilda, daughter of Baldwin, 5th earl of Flanders, father and son took up arms against one another. The dispute was ultimately adjusted through the intercession of queen Matilda. Most of the latter part of William's life was spent in Normandy, the government of England being intrusted mainly to his half-brother, Odo, bishop of Bayeux. William was of a corpulent habit of body, at which fact it seems that his brother monarch, Philip I. of France, had pointed some sarcasm. William, in a fit of wrath, raised an army and invaded France. He took the city of Mantes, and set it on fire; but while in full enjoyment of the blaze, his horse, stumbling on some hot embers, threw him, and the injury he received proved fatal. He died Sept. 9, 1087. Stern and ruthless as William undoubtedly was, he yet knew how to govern a nation and protect it from foreign aggressions. For more than two centuries England had been harrassed by the frequent descents of piratical hordes. He put an

end to these. Never after William's time did a Norse rover venture to show face on the English coast. In the common administration of justice he was royally impartial, many of his severities are even referrible in part to his thorough hatred of anarchy; while his attitude toward the church is admirable. He clearly defined the limits of ecclesiastical judicature, and when the formidable Hildebrand desired that the conqueror should do homage to him for the kingdom of England, the latter boldly refused.

WILLIAM II., King of England, surnamed *Rufus*, second son of William the conqueror, was born in Normandy in 1056. He was educated by the celebrated Lanfranc, archbishop of Canterbury. He was the favorite son of his father, who, on his death-bed, recommended him to the barons and prelates as his successor to the crown of England. William was, at the time of his father's death, along with him in Normandy. But no sooner had the event taken place than he set out for England. Landing at Dover, he obtained possession of its castle and of several other fortresses. He then presented himself to Lanfranc, who proposed him to the nobles and prelates as their king. No opposition was offered, and William was crowned on Sept. 26, 1087. Meanwhile, his elder brother, Robert, had entered upon possession of the duchy of Normandy. The relative position of the brothers was such as, in these times, was sure to lead to war between them. Robert, at the instigation of Odo, bishop of Bayeux, endeavored to excite an insurrection in England. This attempt having failed, William, in revenge, invaded Normandy in Jan., 1091. An arrangement having been ultimately come to through the mediation of Philip I. of France, Robert and William then turned their united arms against their third brother, Henry, who had purchased from Robert the district of Cotentin, comprising nearly one-third of Normandy. The fortune of war went against Henry, who was driven into exile. Returning to England, William's next enterprise was an invasion of Scotland. The life of William seems to have been a continual scene of strife. Returning from Scotland, he felt himself called upon to renew the contest with his brother, who had, meanwhile, strengthened himself by an alliance with Philip of France. A pecuniary payment, however, by William to Philip soon dissolved the bond between him and Robert. William would now, doubtless, have taken signal vengeance on his brother, had he not been recalled to England by disturbances in Wales and in the north. In the year 1096, Robert, having resolved to go to Palestine, sold his duchy of Normandy to William, for £10,000. This transaction led to a contest between William and a chieftain named Helie de la Flèche, who had all along disputed Robert's right to the Maine district of Normandy. Helie was not, however, able to withstand the English monarch, who now took the field against him. He was obliged to disband his forces and take to flight. This was the last warlike achievement of William Rufus. He was shot (it is said, accidentally, though there appears equally good reasons to believe the act intentional) by an arrow, supposed to come from the bow of sir Walter Tyrrrel, while hunting in the New forest, Aug. 2, 1100. His body was found by a poor charcoal-burner, who conveyed it in a cart to Winchester. William inherited the courage, energy, and political talent of his father, but he was ruthless and unprincipled.

WILLIAM III., King of England, was the posthumous son of William II. of Orange, and Mary, eldest daughter of Charles I. of England. He was born in 1650. The alliance of his family with the Stuarts excited the jealousy of Oliver Cromwell, and by his influence the young prince and his descendants were declared to be excluded from the stadtholdership of the United Provinces. William "found himself," says Macaulay, "when first his mind began to open, the chief of a great but depressed and disheartened party, and the heir to vast and indefinite pretensions, which excited the dread and aversion of the oligarchy, then supreme in the United Provinces." The restoration of the Stuarts, however, in England greatly improved his prospects; and on the murder of De Witt, William, then in his 22d year, was chosen stadtholder. The republic was at this time carrying on an apparently hopeless war with its powerful neighbor, Louis XIV. of France; but by the wisdom and determination of the young stadtholder, the contest, which lasted for nearly seven years, was in 1673 terminated by the treaty of Nimueguen, in a manner highly advantageous and honorable for the United Provinces. A few years before, their ruin had seemed inevitable; and the fame of William became great over Europe. Shortly before this event, he had married his cousin, the princess Mary, eldest daughter of the duke of York, afterward James II. of England. This marriage, entered into solely from political considerations, did not at first prove a happy one. William seems to have been jealous of his wife's position, and too reserved to give utterance to his feelings. According to Macaulay, a complete explanation and reconciliation were ultimately brought about by the agency of bishop Burnet.

In 1686 William became the head of a league formed among the Protestant princes of Germany, the kings of Spain, Sweden, and others, having for its object to curb the power of Louis XIV. The treaty by which the alliance was constituted was signed at Augsburg in July, 1686. In England the tyranny of James II. was now beginning to estrange from him the affections of every class of his subjects. The eyes of all were turning toward the stadtholder as their only hope. Having formed his resolution, William conducted his operations with great secrecy and skill. On Nov. 5, 1688, he landed at Torbay, with an army of 15,000, composed of English and Dutch. His success was rapid and bloodless. Men of influence of all parties gave him their

presence and support; and on Dec. 18 following, he entered London triumphantly as a national deliverer. The adherents of James held out for some time in Scotland and Ireland; but the death of Dundee ended their resistance in the former country; while in the latter it was ended in 1691, after a vigorous contest of two years, in which the Stuart party had, in most cases, the advantage. The object of William in accepting the crown of England was probably not so much to free the English nation from the tyranny of James, as to enlist its power on his side against that of France. In spite of his sterling qualities, and of the debt which they owed to him, the English nation never really liked William III. The death of his wife, on whom the crown had been conferred jointly with himself, in 1695, materially injured his position. His schemes were thwarted by parliament; continual plots for his assassination were hatched by the adherents of James; and in his warfare with France, victory was almost always on the side of Louis, William being in person repeatedly defeated by Luxembourg (q.v.); and it was not without a struggle and a pang that he agreed to the terms of the peace, eminently popular, however, which was concluded at Ryswick on Sept. 10, 1697. The death of Charles II. of Spain in 1700, and the succession of Philip of Anjou, was another blow to his policy. He carried it on, however, with unflagging vigor till his death, which was occasioned by a fall from his horse, on Mar. 8, 1702. The massacre of the Macdonalds of Glencoe (q.v.), and his conduct to the promoters of the Darien scheme (q.v.), are two blots on William's reputation which his most thoroughgoing apologists have been unable to efface. However, he was undoubtedly a practical genius of the highest order, and the services which he rendered both to England and to his native country can hardly be overrated. During his reign the bank of England had been founded, the modern system of finance introduced, ministerial responsibility recognized, the liberty of the press secured, and the British constitution established on a firm basis. In his domestic life he committed the error of a too stern repression of all manifestation of kindly or genial feeling. His manner was wholly Dutch, and even his countrymen thought him blunt. "In his intercourse with the world in general," says Lord Macaulay, "he appeared ignorant or negligent of those arts which double the value of a favor, and take away the sting of a refusal."—See Macaulay's *History of England*.

WILLIAM IV., King of Great Britain and Ireland, third son of George III., was born on Aug. 21, 1765. Until 1771 he remained, along with the prince of Wales and prince Frederick, under the care of Dr. Majendie. He was then sent to Kew, where, with prince Edward, afterward duke of Kent, he was under the guardianship of col. Bude. On June 15, 1779, he entered the navy as midshipman on board the *Prince George*, then under rear-admiral Digby. The *Prince George* then joined admiral Rodney's squadron, on its way to Gibraltar. After seeing a considerable amount of service, prince William was made a lieutenant on June 17, 1785; and in the year following he received his commission as captain. In 1789 he was created duke of Clarence and St. Andrews, and earl of Munster, with an allowance from parliament of £12,000 a year. Subsequent to this, several acts of insubordination rendered an actual continuance of his professional career impossible. He was, however, formally promoted through the successive ranks until he was made admiral of the fleet in 1801. Meanwhile, however, he had been living almost entirely ashore, along with Mrs. Jordan, a celebrated actress, with whom he had become connected in 1791. By her he had a family of five sons and five daughters, who became known by the surname Fitz Clarence, and were raised to titular dignities. On July 11, 1818, he married Adelaide, eldest daughter of the duke of Saxe-Meiningen. The issue of this marriage was two daughters, both of whom died in infancy. By the death of the duke of York, in 1827, the duke of Clarence became heir-presumptive to the throne, to which he succeeded, on the death of his brother, George IV., on June 26, 1830.

The great event of the reign of William IV. was the passing of the reform bill. After a fierce and protracted struggle, the bill was read a third time in the house of lords on June 4, 1832, and three days afterward it received the royal assent. The first reformed parliament met on Jan. 29, 1833. The abolition of colonial slavery, the reform of the poor-laws, and of the Irish church, were the immediate results of the great constitutional change. King William died, after a short illness, on June 20, 1837. He was succeeded by his niece, queen Victoria.

WILLIAM THE LION, one of the early kings of Scotland, succeeded his brother, Malcolm IV., in 1165. He is commonly called William the Lion, but why he obtained that title is one of the mysteries of history. When heraldry long afterward became a science, and was supposed to have been in use earlier than it really was, it was not unnaturally supposed that he was the first king who used, as a heraldic achievement, the lion, afterward the chief feature in the arms of Scotland. His predecessors had long contested with the kings of England the sovereignty of Northumberland and other districts of what is now the north of England. Under Malcolm, these claims were virtually abandoned, and the king of Scots received, as a sort of equivalent for them, the earldom of Huntingdon and other valuable estates holding of the English crown. William had still, however, a hankering after the Northumbrian districts. He attended Henry of England in his continental wars, and is supposed, when doing so, to have pressed for a portion at least of the old disputed districts. In his disappointment, he

invaded them, after the example of his ancestors. On July 13, 1174, he fell, almost by accident, into the hands of an English party. For security, he was conveyed to Normandy, and there he consented, as the price of his liberation, to perform that homage for his kingdom which the English kings so long in vain attempted to exact from the government of Scotland. How far the Scots community would have admitted that he had a right to bind them to such a condition, may be doubted. The treaty of Falaise, however, as the transaction was termed, from the place where it was adjusted, was revoked in the year 1189 by Richard I. of England, in consideration of a payment of 10,000 marks, which he wanted for his celebrated expedition to Palestine. William had several disputes with the church, but he was one of the early benefactors of the regular ecclesiastics, and founded, in 1178, the great abbey of Arbroath, which he dedicated to Thomas à Becket, who had been slain eight years earlier. King William died in 1214.

WILLIAM, Prince of ORANGE, and Count of NASSAU, the founder of the independence of the Netherlands, was born at Dillenburg, April 16, 1533. His father, William, was the second son of count John of Nassau-Dillenburg, and succeeded to the German possessions of the family; while his elder brother, Henry, obtained the extensive estates in Luxemburg, Brabant, Flanders, and Holland. The latter also, by his marriage with Claudie of Chalons, added the charming and valuable little principality of Orange to his already extensive domains; but his son René, dying without issue, left Orange along with the Low Countries' estates to William, in 1544. William had hitherto lived at Dillenburg under the care of his father, who was a zealous Lutheran; but on his becoming the most powerful lord of the Low Countries, he was sent to the queen regent's court at Brussels, and brought up in the Catholic faith. At the age of 15 he became page to the emperor Charles V., who took an almost paternal care of him, attentively watched the development of his character, and, satisfied with the result, took him into his inmost confidence, making him the safe repository of the most important secrets, employed him in various diplomatic offices; and, in 1555, promoted him, over the heads of all his veteran officers, to the command of the imperial army on the French frontier. In all these various situations, William acquitted himself completely to his patron's satisfaction; displaying acute intelligence, sound judgment, and a precocious knowledge of men, while bearing himself with a grace and dignity of manner that gained universal esteem. Charles, on his abdication, strongly recommended William to his son Philip as a confidential adviser; and accordingly, we find him employed to draw up the treaty of Cateau-Cambresis, and selected as one of the four hostages to be given to France for its fulfillment. During William's residence in France, he was confidentially informed by Henry II. of a secret arrangement which was being formed between France and Spain for the complete extermination of heretics in both countries; and with admirable nerve, dissembling his horror of the project, he resolved in his own mind to oppose the execution of the scheme in the Netherlands to the uttermost of his power. On returning to the Low Countries, he became the leader of the party which devoted itself to the maintenance of the chartered liberties of the country, agitated for the recall of the Spanish troops, opposed the augmentation of the number of bishoprics (a pet scheme of Philip's, for his opposition to which he first incurred the bitter dislike of his sovereign), and finally broke entirely with cardinal Granvelle, the president of the council, and the willing agent of Philip's tyranny. Expostulations to the regent Margaret of Parma, and directly to Philip himself, far from producing any good result, seemed only to hurry the bigoted monarch to more extreme measures; the cruel edicts against heretics were made still more stringent, and at the end of 1564 the inquisition was established. William, however, steadily refused to allow these oppressive enactments to take effect in his hereditary governments of Holland and Zealand; and though he did not join in the famous protest known as the "compromise" which was presented to the regent by the "beggars," he supported their proposals at court, seeing that, though maintained with somewhat too much violence, their aims were the same as his own. For the next few years he was unremitting in his exertions to impress both the rulers and the people with the desirableness of moderation, and on several occasions succeeded by his personal influence in repressing religious dissension. Hitherto he had labored conjointly with counts Hoorn and Egmont, but failing to convince his two associates of the rank duplicity of the king, of which he himself was assured by means of the spies in his pay at the Spanish court, and of his perfidious designs against them, he was compelled to leave them to their fate, and retired to his German estates. Hoorn and Egmont were seized and executed: William, cited as a rebel (Jan., 1568), and, on the ground of being a knight of the golden fleece and a sovereign prince, refusing to appear, had his estates confiscated, and the duke of Alva arrived at Brussels, to reduce the provinces to submission. William had hitherto lived in a most luxurious and extravagant manner, the splendor of his household far exceeding that of his royal master; but now he effected a thorough retrenchment, and disposed of his valuables, to equip four armies for the invasion of the Low Countries. Two of the armies failed completely; the third, under his chivalrous brother Louis, was destroyed at Jemmingen by Alva; and the fourth, 30,000 strong, under his own immediate command, lay in Brabant, unable to force Alva's army to a conflict, till want of the means of paying his soldiers forced him to retreat. His next

attempt was made in 1572, and though as unsuccessful on land as before, he succeeded in exciting Holland, Zealand, Gelders, Overijssel, and the bishopric of Utrecht to rise for their liberties; and was proclaimed by these provinces as their stadtholder for the king, whose authority he and they still acknowledged. Meantime, his coadjutors, the "beggars of the sea," had taken Brill and Flushing, and had committed heavy depredations on Spanish commerce. But ere long the fortune of the Spaniards on land was again in the ascendant; fortress after fortress fell into their hands, despite William's utmost efforts to relieve them; and though Holland and Zealand still remained faithful to the cause of liberty, he found it impossible to raise an army which could fairly cope with the enemy. He succeeded, however, by breaking the dykes, in saving Leyden, though Antwerp and Haarlem experienced all the horrors of a siege and capture. It was at this period that William openly professed himself a Calvinist, though, with his usual moderation, he utterly disclaimed the bigoted fanaticism which characterized his co-religionists, and in which they went near to equal their adversaries the Catholics. Success still attended the patriot fleet, and though the gallant Louis, with his brother Henry, was defeated and slain at Mooker-Heide (April 14, 1574), the ruinous condition of the Spanish finances, and the general detestation in which the soldiers of Philip were justly held, helped William to hold his ground. In March, 1575, conferences were opened at Breda between the belligerents, but Philip obstinately refusing to yield an iota, they were broken off; and in October of that year the provinces of Holland and Zealand pronounced Philip's deposition, and gave power to William to choose the country under whose protectorate they were to be placed. Meantime, the rapacity of the Spanish soldiery had roused the fifteen provinces which still remained loyal to Philip, and the league, known as the *Pacification of Ghent* (Oct., 1576), the object of which was to drive out the foreign troops, and establish, at least for a time, toleration in religion, was the consequence. This was a brilliant success for William; and though Don John of Austria, the new governor, tried to dissolve it by the "perpetual edict" (Feb. 12, 1577), in which he granted nearly all demands, William succeeded, by skillful policy, in foiling the attempt. War was accordingly resumed, and the patriots were defeated at Gembloux (Jan. 31, 1578), though their spirits were from time to time buoyed up by an occasional success. The next governor, Alexander Farnese, succeeded, however, in detaching the Walloon provinces from the league, though, to compensate for this, William obtained the signature of the *Union of Utrecht* (Jan. 23, 1579), the first foundation of the Dutch republic. In the following year his two faithful provinces, Holland and Zealand, after having been nominally under the sway of the archduke Matthias of Austria, and of the duke of Anjou, proclaimed William their sole ruler, the duke of Anjou being still acknowledged as sovereign of the others. William, however, after his long and desperate struggle for his country's freedom, was not destined long to enjoy the honors of sovereignty, for, on March 15, 1580, Philip had, by Granvelle's advice, put a price of 25,000 gold crowns on his head, and the incitement of this magnificent bribe produced various attempts to assassinate him, the last of which, by Balihassar Gerard, was successful, at Delft, July 10, 1584. William was four times married, and left by his first wife, Anne of Egmont, Philip-William, prince of Orange; by his second, Anne of Saxony, the famous Maurice (q.v.); and by his fourth, Louise de Coligny, Frederick-Henry, who succeeded Maurice as stadtholder of Holland.

WILLIAM I. (FREDERICK WILHELM), first king of the Netherlands; 1772-1843; b. Brussels; grand-nephew of Frederick the great. Under the title of prince of Orange, he commanded the Dutch army till the conquest of his country by France, soon after which he went to Berlin. In 1802 his father, the last stadtholder, gave him the principality of Fulda, with other districts; but they were taken from him in 1806 on account of his refusal to join the Rhenish confederation. Becoming a gen. in the Prussian service, he was captured by the French at Jena. He was soon released, and entered the Austrian service. In accordance with the arrangements made at the congress of Vienna he was declared king of the Netherlands (including Belgium) in 1815; and he exchanged his territories in Germany for the grand-duchy of Luxembourg. Belgium gained its independence by the assistance of France, 1830-32. He abdicated in 1840 in favor of his son William II.

WILLIAM II. (FREDERICK GEORGE LEWIS), King of the Netherlands, son of William I., was b. at the Hague, Dec. 6, 1792. In 1795 his father sought an asylum in England, and a few years latter went to settle at Berlin. The young prince studied at Berlin and Oxford; and in 1811, joining the army in Portugal, he served on the staff of lord Wellington, to whom he became adj. and speedily obtained the rank of col. His bravery was conspicuous at Fuentes de Onoro and Ciudad Rodrigo. At Badajoz, the storming column having been repulsed, the young prince met and rallied the retreating troops, leading them anew to the attack, and was the first to spring into the breach. He took an active part at Salamanca, Vittoria, and the battles of the Pyrenees. On the return of the Orange family to the Netherlands, William I. made him commander of the army. The last campaign of Napoleon brought the prince again into active service, and he gained fresh laurels at Quatre Bras and Waterloo, where he was wounded. The prince of Orange married, Feb. 26, 1816, Anna Paulowna, youngest sister of the emperor Alexander I. of Russia. When the Belgian revolution began, in 1830, he was

called again into public life; and, as governor of the loyal districts, tried by concessions to allay the storm, but the provisional government at Brussels was not to be satisfied, and having overstepped the limits of his commission, the prince was recalled. In July he took command of the army, and pushed to the center of Belgium; when, at Louvain, his victorious course was interrupted by French intervention, and the Dutch army retired to the north. Having more liberal views than were then common, the prince took little share in state affairs, and spent his life chiefly at Tilburg, as commander of the army of observation. On the abdication of William I. (see NETHERLANDS), the prince of Orange assumed the reigns of government (1840) as William II. The political movements of 1848 were felt in the Netherlands, as in other countries; and the ministerial plans of reform not having satisfied the party of progress, the king announced his willingness to sanction whatever changes in the constitution were thought necessary, and the storm was averted. The new constitution was proclaimed Nov. 3, 1848. William died on Mar. 17, 1849, regretted by all ranks. He was marshal in the British army, and held a multitude of European orders.—See *Het Leven van Willem II.*, door J. J. Abbink; also the same by Besseha.

WILLIAM III. (ALEXANDER PAUL FREDERICK LEWIS), reigning king of the Netherlands, was b. Feb. 19, 1817, and succeeded to the throne on the death of his father, William II., in 1849. The kingdom has since enjoyed uninterrupted peace; material prosperity has increased, and the public debt has been considerably reduced. William's reign has been chiefly distinguished for undertakings which contribute to the true greatness of a nation. The drainage of the Haarlem lake (q.v.) was completed in 1852, removing an ever-enlarging enemy, and adding nearly 50,000 acres to the wealth-producing power of the country. In 1863 the slaves in the Dutch West Indian colonies were emancipated, under wise restrictions. Railways have been extensively constructed; the waterway to Rotterdam is being improved; and the isthmus of Holland has been cut by a canal, which is continued through the IJ, and when completed will admit vessels drawing 22 ft. direct to Amsterdam; while two piers have been built into the North sea to form a harbor. While prince of Orange, William married, June 18, 1839, the princess Sophia Frederica Matilda, daughter of the late king William I. of Wurtemberg. They have two sons—William Nicholas Alexander Frederick Charles Henry, prince of Orange, b. Sept. 4, 1840; and William Alexander Charles Henry Frederick, b. Aug. 25, 1851.

WILLIAM I. (GER. FRIEDRICH-LUDWIG WILHELM), King of Prussia, and, since 1871, emperor of Germany, is the second son of Frederick William III. and was b. Mar. 22, 1797. He joined the army at an early age, and was engaged in the campaigns of 1813-14 against France. On the accession of his elder brother, Frederick William IV. (q.v.), to the throne in 1840, William became governor of Pomerania, and afterward sat in the Prussian diet, and vigorously supported the absolutist party. In consequence, he was much disliked by the people that on the outbreak of the revolution in 1848 he had to flee to England; though he returned some months after, and was elected to the national assembly. However, from this time he interfered little in the quarrels between the constitutionalists and absolutists, though he gladly accepted the command of the troops dispatched to put down the rising in Baden; and in Oct., 1857, the king having become incapacitated for business, William was commissioned to act as regent, a commission renewed from time to time till his permanent installation in Oct., 1858. At this time he was very popular in Prussia, owing to his supposed opposition to some of the obnoxious measures of the king's ministers, and to his vigorous advocacy of conjoint action with Britain and France in the war of 1854; and his election as regent was consequently opposed by the aristocratic and pietistic parties, who were, on his elevation, dismissed from power, and a more liberal ministry formed. On Jan. 2, 1861, William ascended the throne; and the occasion of his coronation, Oct. 18, following, he himself put the crown on his head, declaring that he "ruled by the favor of God, and of no one else." The result of the elections to the chamber of deputies, which were being carried on at the same time, being much in favor of the liberal party, William, who was quite astonished at the fact of the party whom he looked upon as the opponents of the crown having a majority, attributed it to the intrigues of secret enemies; and in his address at the opening of the chambers, saying that he "never could permit the progressive development of our inner political life to question or to endanger the rights of the crown and the power of Prussia," disclosed the principle of his policy, a policy which, with all the unflinching perseverance and unconquerable obstinacy which characterize men, like him, of thorough honesty, unflinching firmness, and considerable narrow-mindedness, he has since unremittently pursued. The first chamber which sat after his coronation was dissolved, despite the protest of a large majority of the members; but the succeeding elections further increased the liberal majority; and though some popular measures were brought forward, and some obnoxious taxes abolished, the new chamber proved as refractory as its predecessor, and refused its consent to the extensive changes in the Prussian military system (the king's pet scheme), and to the raising of money by loan, to be applied for that and other ministerial projects, till its constitutional powers were fully acknowledged. On Sept. 22, 1862, Herr von Bismarck-Schönhausen, formerly the ambassador at Paris, was made prime minister; and the deputies having not only rejected the ministerial budget, but resolved that the expenditure of money not sanctioned by them was

a breach of the constitution, the chamber was dissolved, Oct. 14, the king declaring by message that as the three estates could not agree, he should continue to do his duty to his people, without regard to "these pieces of paper called constitutions," in which he had no faith. The number of the liberals was further increased in the following year, and the contest continued; the deputies displaying the same firmness and extreme moderation as before; while the king and his ministers made it plainly understood that if the lower chamber did what the government asked it to do, all would be well; but if not, the king would "do his duty" without its aid. However, this strife between the old feudal and the modern liberal doctrines was shelved at the close of 1863, by the able strategy of Bismarck, who revived the old dispute with Denmark regarding its government of Sleswick and Holstein, and by forcing Austria to conjoint action, contrived to make the question one of "German" interest. See SLESWICK. Then came the war (see GERMANY) between Prussia and Austria. William became the head of the North German Confederation in 1867. At Ems, in July, 1870, took place the memorable interviews between William and the French ambassador, Benedetti, which ended in the war of 1870-71. William accompanied the army, and commanded at the decisive battles of Gravelotte and of Sedan. On Jan. 18, 1871, William was proclaimed emperor of Germany in the palace of the French kings at Versailles; and now, as if completely to re-habilitate the old imperial title, the ancient enmity between pope and emperor has been fully revived by the recent educational measures of the German government. In May, 1878, the emperor was twice shot at, being seriously wounded the second time. These attempts were attributed, directly or indirectly, to socialist influence, and have led to legislation tending to repress socialism. William married, June 11, 1829, Maria Louisa of Saxe-Weimar, by whom he has issue Frederick William (q.v.), the crown prince of Prussia; and Louisa, the present grand-duchess of Baden.

WILLIAM THE SILENT. See WILLIAM, PRINCE OF ORANGE, *ante*.

WILLIAM AND MARY COLLEGE, next to Harvard college, the oldest institution of learning in America, was established at Williamsburg, Va., 1693, and endowed with lands, and placed under the patronage of the king and queen of Great Britain. The trustees of the hon. R. Boyle, the English philosopher, who left his personal estate for "charitable and pious uses," presented a great part of it to this college for the education of Indians. At the revolution it lost most of its possessions, half the students entered the army, and the French troops occupied its buildings as a hospital. Here were educated presidents Jefferson, Madison, and Monroe, chief-justice Marshall, and gen. Scott. In 1875-76 there were 7 instructors and 86 students.

WILLIAM AND MARY COLLEGE (*ante*), at Williamsburg, Va., is after Harvard, the oldest in the United States, having been chartered by William and Mary in 1693. In 1619 grants of land for a college near Richmond, Va., had been obtained, but the design was frustrated by the Indian massacre of 1622. In 1660 the grants of land were renewed; but not until 1693 was a royal charter and endowment secured. The institution was appointed surveyor general of Virginia; and by its charter was entitled to a penny a pound on all tobacco exported from Virginia and Maryland. In 1766 these privileges were worth more than \$5,000 per annum, but the revolution cut them off. Until 1776, also, it shared with Harvard the interest of a fund left for educational purposes by the hon. Robert Boyle. While the institution suffered such losses by the revolution, it was a cordial advocate of it. Itself a result of the revolution of 1688, its students were enthusiastic friends of that of 1776. George Washington, having been examined by it, was made one of its surveyors. One of its graduates (Jefferson) wrote the declaration of independence. Several of them signed it; and many more maintained it in war and adorned it by distinguished services in time of peace. Besides the losses suffered in two wars, the college buildings have been three times destroyed by fire. The institution maintains its existence in the midst of obstacles, and hopes for future success. In 1879 it reported 6 instructors and 35 students in the collegiate department.

WILLIAMS, a co. in n.w. Dakota; on the Missouri river; 2,500 sq. miles.

WILLIAMS, a co. in extreme n.w. Ohio, bordering on Indiana and Michigan; 600 sq. m.; pop. '80, 23,821. Co. seat, Bryan.

WILLIAMS, ALPHEUS STARKEY, 1810-78, b. Conn.; graduated at Yale, 1831, studied law and practiced in Detroit, where he was also for some years, judge of probate, and editor of the *Advertiser*, and, from 1849-53, postmaster. He served as lieut.col. of volunteers in the Mexican war, in 1861 was commissioned brig.gen. of volunteers, and in 1862 took command of the 1st division of Banks's corps. At Cedar mountain his troops held the field until a third were disabled. Gen. Williams held commands also at Antietam, Fredericksburg, Chancellorsville, and Gettysburg, in the Atlanta campaign and in the march to the sea, where he led the 20th corps. He was U. S. minister at San Salvador, 1866-69.

WILLIAMS, ELEAZAR, 1787-1858, thought to be a grandson of Eunice, daughter of John Williams, the "redeemed captive"; was educated by friends of the family at Longmeadow, Mass.; was a secret agent of the United States among the Canadian Indians in the war of 1812; became an Episcopal minister, 1826, and was employed among the In-

dians at Green bay. About 1842 he declared himself the "lost dauphin of France," who had been carried secretly from prison in Paris, and brought to America. This claim was ingeniously advocated by the rev. J. H. Hanson, in *Putnam's Monthly* (1853), and afterward in a volume entitled, *The Lost Prince*. Those who believed the story thought that he had a decidedly Bourbon countenance; others regarded him as a good looking half-breed Indian.

WILLIAMS, ELISHA, 1694-1755, b. Mass.; graduated at Harvard college, 1711; preached at Newington, Conn., and afterward at Wethersfield; was president of Yale college, 1726-39, when he resigned because of ill health; was a member of the legislature and a judge of the superior court; served as chaplain to the Connecticut regiment in the expedition against cape Breton, 1743; was appointed col. of a regiment raised for an expedition against Canada, and went to England to collect the pay due to his men.

WILLIAMS, EPHRAIM, 1715-55, b. Newton, Mass.; at first a sailor, then a soldier, and a capt. in the colonial forces in the French war. In 1750 he received from the government a grant of 200 acres of land within the limits of the present towns of Williamstown and Adams. Fort Massachusetts was built there, and he was put in command of that, and the other forts w. of the Connecticut river. In 1755 at the head of a regiment sent to re-enforce sir William Johnson, he was ambuscaded near lake George by a force of French and Indians, and killed. Williams college (q.v.), was eventually founded, with property bequeathed by him for a free school.

WILLIAMS, HELEN MARIA, 1762-1827, b. England; published several volumes of poetry; went to Paris just before the revolution; wrote in favor of the Girondins; and was imprisoned; was released after Robespierre's fall; returned to Paris, 1796; after the peace of Amiens, was again imprisoned. Among her published writings are numerous volumes relating to France and the revolution: translation of *Paul and Virginia*; and the well-known hymn, "While thee I seek, protecting power."

WILLIAMS, JAMES, 1730-80, b. N. C.; settled in South Carolina in 1773, and was a delegate to the provincial congress of that colony in 1775. Four years later he was appointed col. in the state militia. At the battle of Stono the same year, he held a command; and he defeated a combined force of British and loyalists at Musgrove's Mills in 1780. He was killed at the head of one of the attacking columns at the battle of King's mountain.

WILLIAMS, JAMES D., 1808-80, b. Ohio; received only a common school education and became a farmer in Indiana. He was an old school democrat, served many terms in the state legislature as representative and senator, and in 1874 was elected to congress. In 1876 he was the democratic candidate for governor of Indiana, and in a contest unusually exciting from its occurring in the year of presidential elections, defeated his opponent, Benjamin Harrison. He was popular with the working classes, and had a studied plainness in manners and dress:

WILLIAMS, JESSE L., b. N. C., 1807; one of the engineers who made the first survey for the Miami and Erie canal, upon whose construction and that of the Ohio canal he was engaged 1824-32. In the latter year he became chief engineer of the Wabash and Erie canal, and in 1837 was made by the state of Indiana chief engineer of all the internal improvements in that state; and he continued to hold that position, with the exception of 5 years though almost constantly engaged in railroad construction or management. In 1853 he was appointed chief engineer of the Pittsburg and Fort Wayne railroad, of which he soon became a director. He was a government director of the Union Pacific railroad, 1864-69, and was afterward chief engineer of the Grand Rapids and Indiana, and of the Cincinnati, Richmond and Fort Wayne railroads.

WILLIAMS, JOHN, 1582-1650, b. Wales; graduated at Cambridge, 1603, where he was distinguished in a wide range of studies; chaplain to the lord chancellor, 1609, and afterward to James I. with whom he was a favorite; prebendary of Hereford, 1612, of Lincoln, 1613; and of Petersborough, 1616; dean of Salisbury, 1619; and of Westminster, 1620; keeper of the great seal, 1621; bishop of Lincoln, 1621; preached the king's funeral sermon, 1625; offended Charles I.; was condemned after 8 years' proceedings before the star chamber, on the charge of betraying the king's secrets, suspended from his bishopric; fined £18,000; imprisoned in the Tower, 1636-40; released by the long parliament, and restored to his diocese; archbishop of York, 1641; imprisoned again and released 1643; supported the king during the rebellion.

WILLIAMS, JOHN, 1644-1729; b. Mass.; graduated at Harvard college, 1683; was ordained pastor at Deerfield, Mass., 1688; in 1704, 300 French and Indians broke open his house, killed two of his children and started with him, his wife, 6 children and other prisoners for Canada. On the second day Mrs. Williams, unable to proceed, was killed. In Canada he was treated kindly, and in 1706 was redeemed with two of his children and other captives. He resumed his pastoral charge and published a narrative of his imprisonment the title of which, *The Redeemed Captive*, was popularly applied to himself.

WILLIAMS, JOHN, a celebrated missionary, was born at Tottenham, London, June 29, 1796. At the age of 14, he was apprenticed to an ironmonger, and during his appren-

ticeship, displayed a great taste for mechanics, and acquired a knowledge of mechanical arts, which he afterward turned to great account. Having become deeply religious, he offered himself to the London missionary society as a missionary to the South seas. He was ordained in 1816, and sent to Eimeo, one of the Society islands. Two months after his arrival, he was able to preach to the people in their native tongue. From Eimeo, he soon went to Huaheine, and afterward to Raiatea, the largest of the Society group. His labors here were attended with great success; the island became Christian, and the arts and habits of civilization were introduced along with Christianity. Wherever Williams went, he not only preached the gospel, but instructed the people in the arts, so as to elevate them from their state of barbarism. At Raiatea, he heard of Raratonga, the chief of the Hervey islands, and thither he went in 1823. The mission which he founded there was eminently successful; not only Raratonga but the whole group of the Hervey islands being Christianized. In his missionary work, Williams made great use of native teachers, trained by himself. He translated the New Testament into the Raratongan language, and prepared books for the schools which he established. After spending some time in Raratonga, he wished to return to Raiatea; but the island in which he lived lay out of the way of vessels, and he resolved to build one. He made all the necessary tools, and in about 15 weeks completed the vessel itself, a boat 60 ft. long, and 18 wide, the sails of native matting, the cordage of the bark of the *Hibiscus*, the oakum of cocoa-nut husks and banana stumps. In this vessel, during the next four years, he visited many of the South sea islands, extending his missionary labors to the Samoa islands. In 1834 he came to England, where he remained for nearly four years, during which he procured the publication of his Raratongan New Testament by the Bible society, and raised £4,000 for the purchase and outfit of a missionary-ship for Polynesia. In 1838 he returned to the chosen sphere of his labors, visited many of the islands, and finally the New Hebrides, where he hoped to plant a mission, but was killed, Nov. 20, 1839, and most of his body eaten by the savage natives of Erromanga, on the shores of which he had landed. His death was the occasion of great lamentation in the islands which owed to him their Christianization and civilization. Williams was remarkably successful as a missionary, not only by his own preaching, but through the instrumentality of natives whom he trained. He possessed in an extraordinary degree the power of organizing. His mechanical skill and genius were also of great service, and no other missionary has ever been so successful in making the progress of civilization attend upon the progress of Christianity.

WILLIAMS, JOHN, D.D., b. Mass., 1817; graduated Trinity college, 1835; ordained a Protestant Episcopal clergyman, 1841; rector of St. George's church, Schenectady, N. Y., 1842-48; president of Trinity college, Hartford, 1848-53; assistant bishop of Connecticut, 1861; consecrated bishop on the death of bishop Brownell, 1865. He is the author of *Ancient Hymns of the Holy Church*; *Thoughts on the Gospel Miracles*; *Inaugural Discourse at Trinity College*; contributed articles to the *Church Review*; edited Browne's *Exposition of the Thirty-nine Articles*.

WILLIAMS, JONATHAN, 1750-1815, b. Boston; entered business life, several times made voyages to England and the West Indies, and was secretary to Franklin when the latter was ambassador to France. He resided some time in Philadelphia, studied the subject of fortification, and in 1801 became a maj. in the artillery and engineers. By the act of 1802, establishing the West Point academy, maj. Williams was made superintendent of the institute, but resigned in 1803, a question of relative rank having arisen. He was re-appointed with the rank of lieutenant, and made chief engineer. From this time until 1812 he had charge of West Point. He also had charge of the fortifications of New York harbor, and planned castle Williams (Governor's island), fort Columbus and castle Clinton (afterward castle Garden). He was the first to introduce here principles of scientific military engineering and fortification. On the outbreak of the war of 1812 col. Williams claimed command of castle Williams, and on refusal resigned. In 1814 he was elected to congress. He published *Elements of Fortification*, 1801, and other military and scientific works.

WILLIAMS, MONIER, b. Bombay, 1819; studied at King's college, London; entered Oxford, 1838; soon obtained an Indian writership, and studied at the East India college, Haileybury, gaining the first prizes in all the oriental subjects; resigned his Indian appointment, returned to Oxford, and graduated, 1844; prof. of Sanskrit at Haileybury, 1844-58; at Cheltenham college, 1858-60; Boden Sanskrit professor at Oxford, 1860; visited India, 1875. He has published *A Practical Grammar of the Sanskrit Language*; *An English and Sanskrit Dictionary*; *Original Papers Illustrating the History of the Application of the Roman Alphabet to the Languages of India*; *Indian Epic Poetry*; *A Sanskrit and English Dictionary*; *Indian Wisdom*.

WILLIAMS, OTHO HOLLAND, 1749-94, b. Md.; lieutenant of a rifle company at the beginning of the revolution. In 1776 he became maj. in a rifle regiment, which was part of the garrison of fort Washington, N. Y., upon its capture by the British. Williams resisted gallantly, but was taken prisoner. As soon as he was exchanged he was made col. of the 6th Md. regiment. He was afterward adjt. gen. in Gates's army in the south. He distinguished himself at the battle of Camden, and in the army under Greene, gaining the day at Eutaw by his charge.

WILLIAMS, ROGER, founder of the state of Rhode Island, was born at Conwyl Cayo, Wales, in the year in 1606. In his youth he came to London, and attracted the attention of sir Edward Coke by his short-hand notes of sermons and speeches in the star chamber; and was sent by him to Sutton's hospital, now the Charterhouse school, in 1621; and on April 30, 1624, he entered Jesus college, Oxford, where he obtained an exhibition. He studied Latin, Greek, Hebrew, French, and Dutch, and was ordained a clergyman of the church of England, but soon became an extreme Puritan, and emigrated to New England, arriving at Boston, Feb. 5, 1631, "a young minister, godly and zealous, with his wife Mary." He refused to join the congregation at Boston because the people would not make public declaration of their repentance for living being in communion with the church of England; he therefore went to Salem as assistant preacher, but was soon in trouble for denying the right of magistrates to punish Sabbath-breaking and other religious offenses, as belonging to the first table of the law. For his opposition to the New England theocracy, he was driven from Salem, and took refuge at Salem, where he studied Indian dialects. Two years later he returned to Salem, only to meet renewed persecution and banishment from the colony for denying the right to take the Indians' lands without purchase, and the right to impose faith and worship. He held that it was not lawful to require a wicked person to swear or pray, which were both forms of worship; and that the power of the civil magistrate extends only to the bodies, goods, and outward state of men, and not to their souls and consciences. Banished from the colony in 1635, and threatened to be sent back to England in order to prevent the infection of his new doctrines from spreading, he escaped in mid-winter to the shores of Narragansett bay, accompanied by a few adherents, where he purchased lands of the Indian chiefs, founded the city of Providence, and established a government of pure democracy. Having adopted the belief in adult baptism of believers by immersion, Williams was baptized by a layman, and then baptized him and ten others, and founded the first Baptist church in America. Later, he doubted the validity of this baptism, and withdrew from the church he had founded. In 1642 he came to England to procure a charter for his colony, and published a *Key to the Languages of America*, and *The Bloody Tenent of Persecution for Cause of Conscience Discussed*, etc., his chief work on the nature and sphere of civil government. After returning to Rhode Island, he came a second time to England on business of the colony in 1651, when he published *Experiments of Spiritual Life and Health, and their Preservations*, dedicated to his friend, lady Vane, and written, as he says, "in the thickest of the native Indians of America, in their very wild houses, and by their barbarous fires;" also, *The Hireling Ministry none of Christ's*, and *The Bloody Tenent yet more bloody by Mr. Cotton's Endeavor to wash it White in the Blood of the Lamb*. At this period he engaged in an experiment of teaching languages by conversation, and made the acquaintance of Milton. He returned to Rhode Island in 1654, and was elected president of the colony; refused to persecute Quakers, but held a controversy with them, and published *George Fox digged out of his Burrores*. By his constant friendship with the Indians, he was of great service to the other colonies; but they refused to remove their ban, or to admit Rhode Island into their league. He died in 1683.—See *Memoirs*, by James D. Knowles (Boston, 1833); William Gannell (Boston, 1846); Romeo Elton (London, 1852).

WILLIAMS, ROWLAND, D.D., 1817-70, b. England; graduated Cambridge, 1840; fellow and tutor, 1844; vice-principal and prof. of Hebrew in the Welsh theological college of St. David's, Lampeter, and chaplain to the bishop of Llandaff; select preacher at Cambridge, 1854; vicar of Broad Chalk, 1859. He was one of the writers of *Essays and Reviews*, was prosecuted in the court of arches and condemned, 1862, but the judgment was reversed, 1864. He published *Rational Godliness; Christianity and Hinduism Compared; Broad Chalk Sermons—Essays on Nature, Meditation, Atonement, and Absolution; The Hebrew Prophets; Psalms and Litanies*.

WILLIAMS, SAMUEL, LL.D., 1743-1817, b. Mass.; graduated Harvard college, 1761; minister of Bradford, Mass. 1765-80; Hollis prof. of mathematics and natural philosophy, Harvard college, 1780-88; lectured on astronomy and natural philosophy in the university of Vermont; preached at Rutland, Vt., 1789-96, and subsequently two years at Burlington. He surveyed the w. boundary of Massachusetts, 1786, and the boundary line of Vermont, 1805. He published *The Natural and Civil History of Vermont*; was for some time editor and proprietor of *The Rutland Herald*; was fellow of the American academy of arts and sciences; contributed papers on astronomy, etc., to scientific journals.

WILLIAMS, SAMUEL WELLS, LL.D., b. N. Y., 1812; educated at Rensselaer school, Troy. In 1833 he went to Canton, China, as a printer for the American board of missions, and was assistant editor of the *Chinese Repository* for several years. He soon became well versed in both Chinese and Japanese, and translated parts of the Bible into the latter tongue. He published a lesson book and vocabulary on the Chinese, 1841-44; and in 1845 returned to New York, where he published, in 1848, *The Middle Kingdom*, probably the best work extant on Chinese government, geography, education, religion, and social life. Mr. Williams returned to China and was interpreter to Perry's expedition to Japan, 1853-54; was for a short time secretary of the U. S. legation in that country; revisited the United States in 1860; in 1862 was secretary of the Peking legation, and

in 1875 again returned to this country and accepted a position as lecturer on the Chinese language and literature in Yale college. He published, in 1856, a *Tonic Dictionary of the Chinese Language in the Canton Dialect*, and in 1874 his *Syllabic Dictionary of the Chinese Language*, a work of great philological importance. In 1881 he was elected president of the New York Bible society.

WILLIAMS, SETH, 1822-66; b. Maine; graduated at West Point, and was appointed to the artillery. He was aid-de-camp to gen. Patterson during the Mexican war, and was brevetted capt. for his conduct at Cerro Gordo. He was adjutant at West Point, 1850-53. On the outbreak of the rebellion he was appointed brig.-gen. of volunteers. He was McClellan's adjutant-gen., and in 1864 became active inspector-gen. on Grant's staff. He rose to be maj.-gen.

WILLIAMS, STEPHEN, D.D., 1693-1782; b. Mass.; was carried captive from Deerfield by the Indians to Canada with his father, the rev. John Williams, and family; redeemed by the French governor and sent to Boston, 1705, followed by the rest of the family, 1706. He wrote soon after a narrative of the captivity; graduated Harvard college, 1713; taught at Hadley, 1713-14; ordained Congregational minister at Longmeadow, 1716; chaplain in sir William Pepperell's regiment against Louisburg, 1745, and in col. Ephraim Williams's regiment to lake George, 1755; visited the Housatonic Indians at Stockbridge, Mass., and established a mission among them.

WILLIAMS, THOMAS, 1815-62; b. New York; graduated at West Point and was appointed to the engineers. After serving in the Florida campaign and on the frontier he became gen. Scott's aid-de-camp, and went through the Mexican war. He was made brig.-gen. of volunteers in 1861, commanded fort Hatteras till the spring of 1862, and was then put at the head of a brigade in the Ship Island expedition. He led the land troops at Vicksburg, June, 1862, and was killed in August defending Baton Rouge, La., against Breckenridge.

WILLIAMS, THOMAS SCOTT, LL.D., 1777-1861; b. Conn.; graduated at Yale, 1794; studied law, and after admission to the bar practiced at Mansfield and Hartford. He was repeatedly a member of the legislature, and was elected to congress in 1817. In 1829 he became a judge of the Conn. supreme court, and in 1834 was appointed chief-justice, which position he held until 1847. From 1831 to 1835 he was mayor of Hartford. He was president of the American tract society, and left \$30,000 for benevolent objects.

WILLIAMS, WILLIAM, 1731-1811; b. Conn.; graduated at Harvard college in 1751. Attached to the staff of his relative col. Ephraim, he fought in the battle of lake George, 1755. Settling as a merchant in Windham, Conn., he was for many years town clerk, and frequently represented the town in the legislature. He belonged to the Conn. committee of correspondence, was speaker of the house in 1775, and afterward a member of the council and of the committee of public safety. He was a signer of the declaration of independence in the congress of 1776-77, and was again in congress, 1783-84.

WILLIAMS, WILLIAM, 1788-1870; b. Conn.; became a gen. of Conn. militia and an eminent shipping merchant; aided in establishing the Norwich free academy by liberal contributions and active service for many years as president of its board of trustees; taught a sabbath-school and maintained religious services among the Mohegan Indians for 17 years; was an active officer of the Seamen's friend society, and a liberal promoter of Bible and missionary societies.

WILLIAMS, Sir WILLIAM FENWICK; b. Nova Scotia, 1800; became ensign in the royal artillery, 1825. From 1840 to 1843, then being a capt., he served in Turkey, and was brevetted maj. and col. In 1848 he was appointed a commissioner for the settlement of the Turco-Persian boundary, and in 1854 British commissioner with the Turkish army; he was with it when the great victory over the Russians under Mouravieff was won, Sept., 1855. The defense of Kars by gen. Williams was heroic; and after he was forced to surrender his conduct was rewarded with the rank of K.C.B., a baronetcy, a pension of \$1000, and from Oxford the degree of D.C.L. From 1856 to 1859 he was a member of parliament, and subsequently in command at Woolwich and in Canada, and governor-general of Gibraltar.

WILLIAMS, WILLIAM R., D.D., b. New York, 1804; graduated at Columbia college, 1822; studied law and practiced it one year; studied theology and entered the ministry in the Baptist church, 1831, becoming pas.-or of the Amity street church, New York, and continuing there until the present time, a period of 50 years, notwithstanding repeated calls to more conspicuous positions. He has been three times to Europe, and has collected a large and excellent library. Among his published writings, besides many sermons and addresses, are: *Miscellanies; Religious Progress; Christian Character; Lectures on the Lord's Prayer*; and a *History of the Baptists*.

WILLIAMS COLLEGE, an institution of learning in Williamstown, Mass., founded by a bequest of col. Ephraim Williams in 1755; incorporated in 1793, with further endowments of state grant, and the privilege of raising money by a lottery. In 1836 it was provided with an astronomical and magnetic observatory, the first in America. It has since been liberally endowed by Amos Lawrence, Nathan Jackson,

the government, etc., and had, in 1875-76, 11 instructors, 170 students, and a library of 17,000 vols.

WILLIAMS COLLEGE (*ante*), at Williamstown, Berkshire co., Mass., founded in 1793 by the will of col. Ephraim Williams, from whom it takes its name. It had its beginning, however, at an earlier day, in a free school, a part of whose endowment was derived from a lottery. The legislature in 1793 appropriated \$4,000 from the state treasury to purchase a library and apparatus. It is not under the patronage of any religious denomination, though most of its instructors have been Congregationalists, and its influence has been strongly religious, though in no narrow sense. It has an endowment of \$300,000, and an annual income of \$40,000. The original building, now known as West college, and used as a dormitory, was erected 1790. There are three other buildings used as dormitories. Besides these, the other principal buildings are Griffin hall, erected in 1828, and now used for natural history cabinets, lecture rooms, etc.; Lawrence hall, the library building, erected in 1846 by Amos Lawrence of Boston; Jackson hall, presented by Nathan Jackson, of New York, in 1855, to contain the collections of the lyceum of natural history; the college chapel, built in 1860; Goodrich hall, the gift of hon. J. Z. Goodrich, of Stockbridge, in 1864, and intended for a gymnasium, and for chemical and physical apparatus and lecture rooms. Mr. Goodrich has also made provision for building a new gymnasium, which will give enlarged facilities in Goodrich hall to the departments above-mentioned, while providing a large hall for concerts, lectures, etc., in what was before the gymnasium. There is an astronomical observatory. In natural history the college has an ample and valuable cabinet. The geological collection is especially valuable, not only on account of the great number and perfection of the specimens, but because it contains so large a number of rare fossils. The valuable collection known as the "Wilder cabinet" has been purchased for the college for \$8,000. The botanical collections are very rich. The zoological museum contains several thousand specimens. The library has 19,000 vols. In physics the means of illustration are ample. The college has no departments or schools of art, and no professional or post-graduate courses. In 1808 the first foreign missionary society in this country was formed by students of this college, who had devoted themselves to that work, and the formation of the American board of commissioners for foreign missions was in great part the result of this society's labors. The society of alumni, organized in 1831, was the first association of the kind in this country. * The history of the college was published in a volume, in 1860, by the rev. Calvin Durfee. Number of professors in 1880, 12; of students, 203; of alumni, 2,544. President, Franklin Carter, lately professor in Yale college.

WILLIAMSBURG, a co. in e. South Carolina, bounded s.w. by the Santee river; 1200 sq.m.; pop. '80, 24,110—24,060 of American birth; 16,310 colored. Co. seat, Kingstree.

WILLIAMSBURG, a city of Virginia, between York and James rivers, 60 m. s.e. of Richmond, the site of William and Mary college (q.v.), and the Eastern state lunatic asylum. Williamsburg was founded in 1632, is the oldest incorporated town in the state, and was the colonial and state capital till 1779. A battle was fought here between gen. McClellan and the confederates, May 5, 1862. Pop. '70, 1392.

WILLIAMSBURG (*ante*), a t. and co. seat of James City co., Va., near the James river; about 50 m. s.e. of Richmond; the site of William and Mary college, and the Eastern lunatic asylum; pop. '70, 1392. Williamsburg was settled in 1632, being the oldest incorporated town in the state. Before the revolution it was the seat of the provincial government and, until 1779, the capital of the state. An old Episcopal church, built in 1678, is still in use. When, in 1822, the confederate forces evacuated Yorktown, they fell back on Williamsburg and threw up works about 2 m. e. of the town. The federal forces under gen. Sumner, consisting of the divisions of Hooker, Kearny, Stoneman, Couch, Smith, and Casey, followed at once, and on May 6 attacked the enemy's position. A stubborn contest ensued, lasting from early morning until night. In this engagement Hooker's division and Hancock's brigade suffered severely. The day was saved by Hancock's feigning to retreat, and, when the enemy followed, ordering a charge which completely routed the part opposed to him. The loss was nearly equal; about 2,300 on each side. During the night the confederate gen. Johnston withdrew.

WILLIAMSBURGH, N. Y. See **BROOKLYN**.

WILLIAMSON, a co. in s. Illinois, drained by the s. fork of Saline river and the Big Muddy in the n.w. portion; 432 sq.m.; pop. '80, 19,326—19,013 of American birth, 253 colored. Co. seat, Marion.

WILLIAMSON, a co. in central Tennessee, having extensive ledges of Trenton limestone, drained by the Harpeth river; 500 sq.m.; pop. '80, 28,313—28,215 of American birth, 12,360 colored. Co. seat, Franklin.

WILLIAMSON, a co. in central Texas, drained by the San Gabriel river, and Brushy and Salado creeks; 1100 sq.m.; pop., '80, 15,156—14,336 of American birth, 1634 colored. Co. seat, Georgetown.

WILLIAMSON, HUGH, LL.D., 1735-1819; b. Penn.; graduated in 1757 at the university of Pennsylvania, where he was professor of mathematics, 1760-64. He pursued a

course of medical studies at Edinburgh and Utrecht, and settled as a physician in Philadelphia. When in London in 1773 the privy council summoned him and consulted him in regard to American affairs. Returning to the United States in 1776 he became an army surgeon. He served several terms in congress, and was a member of the convention which drew up the constitution. He settled in New York in 1793. Among his writings is a *History of North Carolina* (1812).

WILLIAMSPORT, a city of n. Pennsylvania, on the w. branch of the Susquehanna. It is on the West Branch canal, and the intersection of three railways, and is one of the three great lumber marts of the union. It has 35 saw-mills, 13 planing-mills, 5 iron-foundries, and numerous factories. There are 32 churches, 7 banks, 2 daily and 7 other newspapers; 1 high school, and 8 public schools. Pop. '70, 16,030.

WILLIAMSPORT (*ante*), a city and co. seat of Lycoming co., Penn., on the w. bank of the Susquehanna, 200 m. n.w. of Philadelphia, and a station on the Philadelphia and Reading, the Philadelphia and Erie, and the Northern Central railroads; and on the Pennsylvania canal; pop. '80, 18,934. A suspension bridge crosses the river at this point, and the Susquehanna boom, with a capacity of 300,000,000 ft. of lumber, extends 4 m. up the river. The town is surrounded by high hills and picturesque scenery, and is a pleasant summer resort. Its charter dates from 1861. There are 7 banks, 2 daily and several weekly papers, 32 churches, 10 public schools, and the Dickinson seminary, a fire-department, water-works, and gas. The main industry of the place is the manufacture of lumber, over two billions of feet being sawed yearly; there are also sash and blind, carriage, furniture, and rubber factories; foundries, boiler works, and machine shops.

WILLIAMSTOWN, a t. of Berkshire co., Mass., on the Hoosac river, and a station on the Troy and Boston railroad; 24 m. e. of Troy; pop. '80, 3,395. The place is noted for its grand mountain scenery, and especially as the seat of Williams college (q.v.). There are four woolen factories, a hotel, weekly newspaper, and 3 churches.

WILLIBROD, or **WILBRORD**. SAINT, first bishop of Utrecht, and "apostle of the Frisians," claims notice as being one of that meritorious band of British and Irish missionaries by whom Christianity was established in northern Germany. He was b. about the year 658, in the kingdom of Northumbria; and, although educated in the monastery of Ripon, where he received the tonsure, was sent, for final instruction, like most of the monks of that age, to the schools of Ireland. After a sojourn of 13 years in that country, he resolved to devote himself to the conversion of Friesland, in which some of his fellow-monks had already engaged with little success. In 690 he sailed with 12 companions, and passing up the Rhine, arrived at Ultrajectum, the present Utrecht, soon after the victory of Pepin over the Frisians. By Pepin, they were warmly received; and Willibrod having established the first beginnings of his mission, went to Rome in 692, whence he returned, with the sanction of the pope, Sergius I., and continued his labor till 695, when he again visited Rome, and received episcopal consecration, together with the pallium of an archbishop. Fixing his see at Utrecht, he converted a large number of the inhabitants, and extended his missionary colonies from that center as far as the Danish provinces; and, although he received some check upon the death of Pepin in 714, yet the successes of Charles Martel enabled him soon afterward to resume, under similar favorable auspices, the work which, after many alternations, ended in the successful establishment of Christianity. Willibrod died at a very advanced age in 738, at the monastery which he had founded at Echternach, near Treves. His festival is Nov. 7. See Bede's *Ecclesiastical History*, chaps. 10 and 11.

WILLIMANTIC, a village in the town of Windham, Windham co., Conn., on the New York and New England, the Boston and New York Air Line, and the New London Northern railroads; pop. '80, 8,265. It has churches, schools, banks, hotels, and 2 newspapers. The streets are wide and lighted with gas. The manufacturing interests are extensive, and include prints, silk, thread, metal wares, etc. The Willimantic river affords ample water-power. The thread manufactured by the Willimantic Linen company is well known.

WILLING, THOMAS, 1731-1821; b. Philadelphia; educated in England, where he read law in the temple, London, but returned to this country and became a business partner of Robert Morris. The firm were of great assistance to the revolutionary cause in supplying stores, etc., and also financially. See MORRIS, ROBERT. Mr. Willing became mayor of Philadelphia, judge of the supreme court, delegate to the continental congress of 1775, and president of the provincial congress of 1774. He was the president of the first bank in the United States.

WILLIS, FRANCIS, 1718-1807; b. England; educated at Oxford, took orders, and in 1740 obtained the living at Greatford, Lincolnshire. It was said that he had a remarkable power over the insane. He established an asylum at Greatford, and took a doctor's degree in 1759. For his medical services to George III. in his first attacks of insanity he received a pension of £1500, and for similar services to the queen of Portugal, £20,000.

WILLIS, NATHANIEL, 1780-1870; b. Boston; father of Nathaniel P. In 1803 he founded the *Eastern Argus* at Portland, Me., and in 1816 started the first American religious paper, the *Boston Recorder* (since become the *Congregationalist*), with which he

was connected until 1843. From 1827 to 1857 he was the editor of the *Youth's Companion*, still an excellent periodical, of which he was also the founder.

WILLIS, NATHANIEL PARKER, American author, was b. at Portland, Me., Jan. 20, 1807. His father became the publisher of the *Boston Recorder*, said to be the first religious newspaper ever permanently established. Educated at Yale college, he obtained in 1828 a prize for *Scriptural Poems*. On the completion of his college course, he established the *American Monthly Magazine*, afterward merged in the *New York Mirror*, in which he was associated with George P. Morris. In 1830 he visited Europe, and contributed to the *Mirror* his *Pencilings by the Way*. Appointed *attaché* to the American legation at Paris, he had favorable opportunities for observing European society; and after a visit to Greece and Turkey, returned to England in 1835, and was married to a daughter of a British officer, gen. Stace. While in England, on account of some personalities in his writings, more consonant to American than English manners, he became involved in a quarrel with capt. Marryat, which led to a duel. He contributed to the London *New Monthly* his *Inklings of Adventure*, also published in 3 vols.; and in 1839 returned to New York, and published a literary paper, *The Corsair*, and *Letters from under a Bridge*, written at a beautiful country-seat, named, in compliment to his wife, Glenmary. He wrote also at this period *Tortosa the Usurer* and *Bianca Visconti*, dramas, and the descriptions of scenery illustrated in Bartlett's *United States and Canada*. In 1844 he engaged with gen. Morris in editing the *Daily Mirror*. His wife died, and he revisited Europe, and published *Dashes at Life with a Free Pencil*, 1845; returned to New York in 1846, he was married to a daughter of the hon. Joseph Grinnell, of Massachusetts, and with his former partner established the *Home Journal*, to which he contributed most of the following works, also published in a collected form: in 1850, *People I have Met*, and *Life Here and There*; 1851, *Hurrygraphs*, *Memoranda of a Life of Jenny Lind*; 1853, *Fun Jottings*, *A Health-trip to the Tropics*, *A Summer Cruise in the Mediterranean*; 1854, *Famous Persons and Places*, *Out doors at Idlewild*; 1855, *The Rag-bag*; 1856, *Paul Fane*, or *Parts of a Life else Untold*; 1860, *The Convalescent*. Much of this work was done during a long, brave struggle with what appeared to be consumptive disease. Mr. Willis was an observant and thoughtful writer, discursive, fragmentary, picturesque, sprightly, quaint, and graceful, full of elaborate ease, and ingenious spontaneity. He edited the *Home Journal* (gen. Morris having died in 1864), and resided at his romantic highland retreat of Idlewild, until his death, Jan. 21, 1867.—His sister is a popular writer, under the *nom de plume* of "Fanny Fern;" and his brother, Richard Willis, is a musician and musical critic.

WILLIS, RICHARD STORRS, b. Boston, 1819; brother of Nathaniel P. He graduated at Yale college in 1841, and became a writer for the press. He has edited several periodicals in New York, and has written works on music, of which *Church Chorals and Choir Studies* (1855), is perhaps the best known.

WILLIS, ROBERT, 1800-75; b. London; graduated at Cambridge, 1826, and took orders in the church of England; but is best known as an architect, inventor, and scientist. From 1837 until his death he was professor of natural and experimental philosophy at Cambridge. Among his inventions were the lyophone and odontograph. He published several works on architecture, contributed many articles on mechanics, dynamics, and archæology to scientific papers, and was a member of many learned societies.

WILLIS, THOMAS, 1621-75; b. Wiltshire, England; graduated at Oxford, 1639. He fought as a royalist in the revolution, studied medicine during the protectorate, and at the restoration was made Sedleian professor of natural philosophy at Oxford. In 1666 he became physician in ordinary to Charles II. Willis made important medical discoveries concerning the brain, and published two treatises on the subject—*Anatomy of the Brain* (1644); and *Pathology of the Brain and Nervous System* (1667).

WILLISTON, SAMUEL, 1795-1874; b. Mass.; commenced the study of theology, which he relinquished on account of weakness of the eyes, and engaging in business, acquired a large fortune from the manufacture of buttons. He established in East-hampton, Mass., Williston seminary, 1841, to which he gave \$270,000, and bequeathed \$600,000; endowed two professorships in Amherst college, 1845-47, and gave the college in addition \$150,000. He has three times erected a church at Easthampton, and has been a liberal benefactor to Mount Holyoke female seminary. His total gifts and legacies amount to £1,500,000.

WILLOUGHBY, Sir Hugh, about 1500-54; b. England; in 1553 made admiral of a fleet of three vessels sent out at the expense of the London merchants with license from Edward VI. "to discover strange countries." The vessels took out 136 persons, of whom 18 were merchants having a share in the expenses of the expedition. In July, 1553, a storm on the coast of Norway dispersed the fleet, which was forced to remain on the coast for some time. Two of them went into the harbor of Arzina, in Lapland, where all the crews and passengers were lost. The third was wrecked, but a few of her crew escaped to Archangel.

WILLOUGHBY LAKE, in Westmore, Orleans co., Vt., is about 7 m. in length, and has great depth. There is a peak of considerable height on each shore. Willoughby mountain, the highest of the two, has many rare plants. The place is a summer resort.

WILLOW, *Salix*, a genus of trees and shrubs of the natural order *salicaceæ*, otherwise regarded as a sub-order of *amentaceæ*. This order or sub-order, to which the poplar (q.v.) also belongs, is distinguished by having the flowers naked or with a cup-like perianth; numerous ovules; a naked, leathery, one-celled, two-valved fruit; seeds with long hairs; leaves with stipules. In the willows, the flowers are absolutely naked, the stamens from one to five in number, the leaves simple and deciduous. There are many species, but their precise number is not likely to be soon determined, as they are very difficult to distinguish botanically, and varieties are very numerous. They are mostly natives of the colder temperate regions of the northern hemisphere, although some are found in warm countries, as *salix tetrasperma* in the hottest parts of India, and another species abundantly on the banks of the Senegal. Most of them are shrubs, and some are of very humble growth, particularly those of arctic and alpine regions. Thus, *S. herbacea*, which is common on the mountains of Scotland, seldom rises more than an inch from the ground. *S. arctica* and *S. polaris* are the most northern woody plants. Other small species are also found to the very limits of perpetual snow in different countries, as *S. Lindleyana* on the Himalaya. Some of the species have already been noticed in the articles OSIER and SALLOW. Some of those which more generally receive the popular name willow, are trees of large size, and remarkably rapid growth. The wood of some of them, as the WHITE WILLOW, or HUNTINGDON WILLOW (*S. alba*), and the CRACK WILLOW (*S. fragilis*), is used for many purposes, being remarkably durable, especially in damp situations, although light and soft. It was anciently used for shields. Cork-cutters and others employ it for whetting sharp-edged implements. It is very tough. It is used for making paddles of steamboats, because it wears better in water than any other kind of wood. Willows are often planted as ornamental trees, especially near streams and in moist grounds. Many kinds are also planted on the banks of rivers to retain the soil in its place, and restrain the encroachments of the river. They are the better adapted for this purpose that they grow readily by cuttings; and willow-stakes driven into a moist soil strike root, and soon become luxuriant. The twigs of most of the willows are very tough and flexible, and are used by coopers for making hoops, and by gardeners for tying espalier trees, and for many similar purposes. They are much used for basket-making and other kinds of wicker-work. See OSIER. Willow withes were probably amongst the first ropes used by man. But the young shoots of many of the kinds with ovate or little elongated leaves are comparatively brittle, and ill adapted for wicker-work. Willow trees are sometimes treated as pollards, and the lop used for fuel and other purposes. They are also often grown as coppice-wood, yielding a great bulk of hoops, poles, fuel, etc. The leaves and young shoots are in some countries used as food for cattle, and even dried and stacked for that use. A fragrant water is distilled in the n. of India, from the catkins of the EGYPTIAN or CALIPH WILLOW (*S. Egyptiaca*). A principle called *salicine* exists in the bark of willows, which has been found efficacious in intermittent fevers, and is sometimes used a substitute for quinine. It is crystalline and intensely bitter. The flowers of the willow, which in many species appear before the leaves, are much sought after by bees. The male catkins of many species are very beautiful, the prominent anthers being of a fine yellow color, or as in *S. purpurea*, of a rich purple. The WEEPING WILLOW (*S. Babylonica*), (see WEEPING TREES), is a very ornamental species, a native of the east, now much planted in Britain, and on the continent of Europe, on account of its beautiful pendent twigs. What is called NAPOLEON'S WILLOW is a variety of it.—The white willow or Huntingdon willow is by far the largest species known in Britain. It attains a height of 80 ft., and grows so rapidly that a cutting has been known to become a tree of 30 ft. in ten years. Its head is much branched and spreading, its leaves narrow elliptical-lanceolate, silky beneath, and sometimes also above.

WILLOW-MOTH, *Caradrina cubicularis*, a species of moth, of which the caterpillars feed upon the grain of wheat, often doing very much mischief. The perfect insect is of a mouse color, and its wings are closed flat upon its back when it is at rest. On the upper wings are three transverse wavy lines and some black dots. The under wings are pearly white, with a slight tinge of brown near the fringe, and brownish nervures. The body is slender, the antennæ thread-like. The whole length, without the antennæ, is rather more than half an inch. The caterpillar varies in color from dull ochereous red to dirty green, with a blackish head, two brown spots on the first segment, a wavy line on each side edged with black. The chrysalis is bright brown. This moth is often abundant in summer in hayfields, gardens, and barn-yards. The caterpillar feeds on grain through the winter, and draws the corn together with a thin silken web in February or March, when about to assume the chrysalis state.

WILLS, DAVID, D.D., b. S. C., 1825; graduated at the state college, Columbia, 1847, and the Columbia theological seminary, 1850; pastor of a church, Laurens district, 1851; of a Presbyterian church, Macon, Ga., 1860; president of Oglethorpe university, Atlanta, Ga., 1870; pastor of a Presbyterian church, Washington, D. C., 1875.

WILLS, WILLIAM HENRY, 1810-80; b. England; one of the founders of *Punch*. He belonged to the original editorial staff of the London *Daily News*. In 1850, in association with Charles Dickens, he founded *Household Words*, and he afterward helped to establish *All the Year Round*, from which he retired soon after Dickens's death. He

published some of his contributions under the title of *Old Leaves Gathered from Household Words*.

WILMINGTON, a city and port of Delaware, U. S., on Christiana creek, near its junction with the river Brandywine, 28 m. s.w. of Philadelphia, on the Philadelphia, Wilmington and Baltimore railway. It is a handsome, regular town, commanding fine water-views, and has 45 churches, a town-hall, large hospital, St. Mary's Roman Catholic college, 5 banks, 13 newspapers, and manufactories of steam-engines, railway cars, and wheel car springs, iron steamboats, machinery, galvanized iron; flour-mills, powder-mills, etc. Pop. '70, 30,841.

WILMINGTON, (*ante*), a city in New Castle co., Del., the largest in the state; the terminus of the Wilmington and Reading and the Wilmington and Western railroads; pop. '80, 42,479. It is on the high grounds between the Christiana and Brandywine creeks. The streets are laid out at right angles; the chief business street is Market street; nearly all the buildings are of brick, the making of which is one of the industries of the neighborhood. The principal public buildings are the city hall, custom house, post-office, opera house, and the public institute and library. Of the 46 churches, the central and west Presbyterian, the Grace (Methodist), and the church of the Sacred Heart (R. C.), are the handsomest. The "Old Swedes' church," still in use, was erected in 1698. There are 6 banks, 17 public schools, and many private academies, 5 daily and 8 weekly newspapers, a fine fire department, gas, and horse-cars; water is supplied from the Brandywine. The commerce with the Atlantic coast and the West Indies is considerable. Among the manufactures, the annual products of which amount to nearly \$25,000,000, the most important are iron steamships (Wilmington being the first place in this country where they were built), morocco, cars, carriages, paper, iron, bricks, boots and shoes, cotton goods, foundry and machine work. The city was founded in 1732; incorporated as a borough, 1740; and as a city, 1832.

WILMINGTON, a city and port of North Carolina, on the left bank of the n.e. branch of Cape Fear river, 20 m. from the sea. It has a good harbor, with extensive internal navigation, and railway connections, and large exports of lumber, tar, resin, turpentine, shingles, cotton, etc. During the war of 1861-65, it was one of the chief ports of the confederacy, and was frequented by blockade-runners, until it surrendered to gen. Terry in 1865. Pop. '70, 13,446.

WILMOT, DAVID, 1814-68; b. Penn.; educated at the Bethany academy, and called to the bar. In 1834 he began to practice at Wilkesbarre, but soon afterward settled in Towanda. He was a prominent democratic politician, and a member of congress, 1845-51. A bill appropriating \$2,000,000 to buy Mexican territory having been introduced into congress, Wilmot, Aug. 8, 1846, offered an amendment providing "that as an express and fundamental condition to the acquisition of any territory from the republic of Mexico by the United States, neither slavery nor involuntary servitude shall exist in any part of said territory." This proviso, the "Wilmot proviso," as it was afterward called, passed the house, but not the senate. It was the basis of the free-soil campaign of 1848. Wilmot became a republican; was U. S. senator, 1861-63, and was made a judge of the U. S. court of claims in 1863.

WILNA. See **VILNO**.

WILSON, a co. in s.e. Kansas, drained by the Verdigris and the Fall river; 576 sq. m.; pop. '80, 13,776—13,162 of American birth, 80 colored. Co. seat, Fredonia.

WILSON, a co. in central North Carolina, drained by Moccasin and Contentnea creeks; 350 sq. m.; pop. '80, 16,064—16,047 of American birth, 7,410 colored. Co. seat, Wilson.

WILSON, a co. in central Tennessee, having the navigable Cumberland river for its n. boundary, containing extensive ledges of Trenton and Nashville limestone; 600 sq. m.; pop. '80, 28,748—28,695 of American birth, 8,457 colored. Co. seat, Lebanon.

WILSON, a co. in central Texas, having the Cibola river for its e. boundary, drained by the San Antonio river; abt. 675 sq. m.; pop. '80, 7,118—6,419 of American birth, 903 colored. Co. seat, Floresville.

WILSON, ALEXANDER, American ornithologist, was b. at Paisley, Scotland, July 6, 1766. He was the son of a weaver, and was apprenticed to the weaving-trade, at which he worked seven years, amusing himself at the same time by writing verses. As soon as he was free he gratified a roving disposition by mounting a peddler's pack, and went to Edinburgh to take part in a discussion, in which he maintained the poetic claims of Fergusson against Allan Ramsay, and, in the same cause, wrote *The Laurel Disputed, a Poem*. The piece by which he is best remembered, is a droll poem in the Scottish dialect, styled *Watty and Meg*. He also contributed to *The Bee*, and made the acquaintance of Burns. He was prosecuted for a lampoon upon a resident of Paisley, and condemned to a short imprisonment, and to burn the libel with his own hand at the Paisley cross. Determined to leave a country where his genius was unappreciated, he sailed from Belfast for America, and landed at Newcastle, Del., July 14, 1794, with a few borrowed shillings in his pocket, and no acquaintances. He got work with a copper-plate printer in Philadelphia, then with a weaver; traveled as a peddler in New Jersey, where the bril-

liant plumage of the birds attracted his attention; then engaged as a school-teacher in Pennsylvania, and then walked 800 miles to visit a nephew in New York. Teaching a school once more in New Jersey, he lived near the botanic garden of William Bertram, who was well acquainted with birds, and, stimulated and encouraged in his studies of nature, Wilson resolved to make a collection of all the birds that were to be found in America. In Oct., 1804, he set out on his first excursion, in which he traveled to Niagara Falls, and wrote *The Forsters, a Poem*. In 1805, he learned etching of a Mr. Lawson, from whom he had already learned to draw; and was employed on the American edition of *Ree's Cyclopædia*. He soon prevailed upon the publisher, Bradford, to undertake an American ornithology. In Sept., 1808, he brought out the first volume, but in a style too costly for the tastes and fortunes of the period, so that he obtained only 41 subscribers in the eastern states, and had no better success in the southern. The second volume was, notwithstanding, brought out in 1810. In 1811 he made a canoe voyage down the Ohio, and traveled overland through the lower Mississippi valley, from Nashville to New Orleans, collecting specimens for his third volume. In his eager pursuit of a rare species of bird of which he long wanted a specimen, he swam across a river, and caught cold, which ended in his death, at Philadelphia, Aug. 23, 1813, when he had nearly completed his work—the 8th and 9th volumes being published after his death. It was continued by Charles Lucien Bonaparte, in 4 vols. (1825-33). A monument was erected to his memory in Paisley abbey churchyard in 1874.—See Grosart's *Poems and Miscellaneous Prose of Alexander Wilson* (1876).

WILSON, ALLEN B., b. N. Y., 1827, and learned the cabinet maker's trade. In 1849, having at that time never seen a sewing machine, he invented one in which the material was carried forward by a feeding plate. By this means an endless seam could be formed at any curve. This feeding device he greatly improved in 1850 by giving the roughened feeding-plate four motions. He also introduced the rotary hook and stationary bobbin, the special feature of the "Wheeler and Wilson." In the same year he met Nathaniel Wheeler, and with him and other investors, started the Wheeler & Wilson manufacturing company, the immense works of which are now at Bridgeport, Conn.

WILSON, AUGUSTA (EVANS), b. Geo., 1835; married S. W. Wilson of Mobile, Ala., in 1868. She has written several novels, of which *Bulah* (1859), *St. Elmo* (1866), and *Infelice* (1875) may be mentioned.

WILSON, DANIEL, D.D., 1778-1858; b. London; educated at Oxford; ordained, 1801; became curate of Mr. Cecil, 1802; assistant tutor of St. Edmund's hall, 1804; sole tutor and vice-principal, 1807-12, and also curate of Worton; rector of St. John's chapel, Bedford row, London, 1812; vicar of Islington, 1824; appointed bishop of Calcutta and metropolitan of India, 1832, remaining until his death. He belonged to the low church or "evangelical school" in the church of England, and zealously opposed some of the views maintained in the Oxford tracts. As parish priest and bishop he was distinguished for independence, energy, and fervent piety. His principal works are, *The Christian's Struggle against Sin and Death*; *Sermons on Various Subjects of Christian Doctrine and Practice*; *Lectures on the Epistle to the Colossians*; *Lectures on the Evidences of Christianity*; *Sermons on the Lord's Day*; *Sufficiency of Scripture as a Rule of Faith*.

WILSON, DANIEL, LL.D., a distinguished writer on archaeological subjects, was b. at Edinburgh in 1816. He was educated at the university of his native city, and was early attracted by antiquarian studies. He had been for some time secretary to the Scottish society of antiquaries, when he was appointed professor of history and English literature in the university of Toronto—an institution of which he has done much to increase the prosperity and usefulness. Among his works are *Memorials of Edinburgh in the Olden Time* (1848; new ed. 1878); *Oliver Cromwell* (1843); *Archæology and Pre-historic Annals of Scotland* (1851; 2d ed. 1863); *Pre-historic Man; Researches into the Origin of Civilization in the Old World and the New* (2 vols. 1862; enlarged and re-written, 3d ed. 1876); *Chatterton* (1869); *Culiban: the Missing Link* (1873); a volume of poems called *Spring Flowers* (1875). He edited for some years the journal of the Canadian institute, of which in 1859 and 1860 he was president.

WILSON, GEORGE, M.D., F.R.S.E., chemist, brother of the above, was b. at Edinburgh in 1818. In 1840, after studying in various laboratories, and graduating in medicine at Edinburgh, he received a license as lecturer on chemistry from the royal college of surgeons in that metropolis. He subsequently became lecturer on chemistry in the school of arts, and in the veterinary college; and in 1855 he was appointed professor of technology in Edinburgh university. In conjunction with this office he held the curatorship of the Industrial museum, an institution which owes much of its completeness and order to his knowledge and skill. Professor Wilson, who had long struggled with ill-health, died in 1859. Among his scientific works mention may be made of his *Text-book on Chemistry* in Chambers's *Educational Course*, *Researches in Color-blindness*, and *The Five Gateways of Knowledge*. Other works are the *Life of Carendish* (1851); the *Life of Dr. John Reid* (1852); and, along with Mr. Geikie, the *Memoir of Edward Forbes* (1861). There are also several poems from his pen. A memoir of Wilson, illustrating his singularly attractive character, was published by his sister (Mrs. Sime) in 1860.

WILSON, HORACE HAYMAN, a distinguished Sanskrit scholar, was b. in London, in the year 1786, and was educated for the medical profession. In 1808 he went to India as assistant-surgeon on the Bengal establishment, and in a short time afterward, on account of his proficiency in chemistry, obtained an appointment in the Calcutta mint as assistant to Dr. Leyden. He now applied himself diligently to the study of Sanskrit, and in a few years obtained so high a reputation for his scholarship, that, upon the decease of Dr. Hunter in 1811, Wilson was appointed to succeed him as secretary of the Asiatic society of Bengal, on the recommendation of Mr. H. T. Colebrook. In 1813, Wilson published his first work, viz., *The Mēgha Dūta, or Cloud Messenger, a Poem in the Sanskrit Language, by Kālidāsa; translated into English Verse, with Notes and Illustrations, by H. H. Wilson*. This work, originally published at Calcutta in 1813, was reprinted in London in the following year. His next publication was *A Dictionary, Sanskrit and English, translated, amended, and enlarged from an original compilation prepared by Learned Natives* (Calcutta, 1819-40). This work proved to be of great advantage to students of Sanskrit, and added considerably to Wilson's reputation. His works have been published in a collective edition of 12 vols. (1864-70). Among them as written, edited, or translated by him are: *Select Specimens of the Theatre of the Hindus, translated from the Original Sanskrit*, 2 vols. (Calcutta, 1827); *The Raghū Vansa, or race of Raghū, a Historical Poem, by Kālidāsa, with a Prose Interpretation of the Text, by Pandits of the Sanskrit College of Calcutta* (1832), edited by Wilson; *The Vishṇu-Purāṇa, a system of Hindu Mythology, translated from the Original Sanskrit, and illustrated by Notes* (Lond. 1840); *An Introduction to the Grammar of the Sanskrit Language* (Lond. 1841); *Ariana Antiqua, a Descriptive Account of the Antiquities and Coins of Afghanistan* (Lond. 1841); *History of British India from 1805 to 1835* (1848); *Reg-Veda-Sanhita, a Collection of Ancient Hindu Hymns; translated from the Original Sanskrit* (1850); *A Glossary of Judicial and Revenue Terms, from the Arabic, Persian, Hindustani, etc.* (1855); *Principles of Hindu and Mohammedan Law, republished from the Principles and Precedents of the same, by the late Sir William Hay Macnaghten, and edited by H. H. Wilson* (Lond. 1860). Many of these works were produced while Wilson held the office of assay-master and secretary of the mint at Calcutta. In his official capacity, he often received the thanks of the government of India for reforms in the coinage and other services. He was for many years secretary to the public instruction committee at Calcutta, and took great trouble in directing the studies of the Hindu college. He was at the same time noted for his musical skill, and his talents as an amateur actor. In 1833 the Boden professorship of Sanskrit was founded in the university of Oxford, and Wilson was elected to that lucrative post, not without strong competition. Soon after his arrival in England, he was appointed librarian at the East India house, in succession to sir C. Wilkins. This appointment he held in conjunction with the professorship until his death, which occurred on May 8, 1860. He was married to a granddaughter of the celebrated Mrs. Siddons, by whom he had several children. Wilson, as an orientalist, takes rank with sir W. Jones and H. T. Colebrooke. Many of his researches are embodied in papers contributed to the *Journal of the Asiatic Society of Bengal*, and other periodicals.

WILSON, JAMES, LL.D., 1742-98; b. Scotland; educated at Glasgow, St. Andrew's, and Edinburgh universities; emigrated to America; studied law and practiced in Reading, Penn., and Annapolis, Md. In 1778 he settled in Philadelphia. He was prominent in the discussions preceding the revolution, was a member of the congress of 1775 and strongly advocated independence. He was also a delegate in 1783 and 1786, and a member of the constitutional convention of 1785. In 1789 he was made a judge of the U. S. supreme court, and in 1790 became law professor in the university of Pennsylvania. He published with Thos. McKean, *Commentaries on the U. S. Constitution*.

WILSON, JAMES, 1795-1856; b. Scotland; the brother of John ("Christopher North"). He studied law, traveled several years on the continent, and settled near Edinburgh, where he spent the rest of his life. He had an extensive knowledge of natural history, and published several books on various branches of the subject. He also contributed many articles to *Blackwood's Magazine* and the quarterlies, and wrote the articles on natural history and zoology in the *Encyclopædia Britannica*. In 1859 Dr. James Hamilton published his *Memoirs*.

WILSON, JAMES GRANT, b. Edinburgh, 1832; emigrated in 1833 to the United States, and was associated with his father in the publishing business at Chicago. He served in the war of the rebellion, and has since lived in New York. Among his works are *Illinois in the Rebellion; Life and Letters of Fitz-Greene Halleck; Poets and Poetry of Scotland; Sketches of Illustrious Soldiers*; and a *Biography of Bryant*, prefixed to the memorial edition (1880) of the latter's *Family Library of Poetry and Song*.

WILSON, JAMES HARRISON, b. Ill., 1838; graduated at West Point, 1860, and was commissioned in the topographical engineers. He served at fort Pulaski and Port Royal; with McClellan at South Mountain and Antietam; at Vicksburg; through the Wilderness and Shenandoah campaigns, and elsewhere. In 1865 he commanded several cavalry expeditions into Georgia and Alabama, and captured Selma, Montgomery, Columbus, and Macon. Jefferson Davis was captured by troops under his command.

He was rapidly promoted, and left the army in 1870 with the brevet rank of maj.gen. He has since engaged in railroad management, and now resides in Boston, and is president of the New York and New England railroad.

WILSON, JOHN, 1588-1667; b. England; studied at Eton, 1588-1602; graduated, Cambridge, 1606; obtained a fellowship; studied law three years; was ordained in the church of England; chaplain to lady Scudamore; preached at Mortlake, Henley, Burnsted, Stoke, and Candish; minister of Sudbury, Essex, but was repeatedly suspended by the bishop's court; embarked for America, 1630, at the Isle of Wight, with Winthrop and others of the Massachusetts colony, and landed at Salem, Mass. At Charlestown he organized a church consisting of himself, governor Winthrop, Isaac Johnson, and deputy-governor Thomas Dudley, which afterward became the First church of Boston; was ordained teacher in this church by the imposition of the hands of the members; ordained as its pastor, 1632. In 1634 he visited England, returning with his wife, and the renowned Hugh Peters who was compelled to leave for non-conformity. With governor Winthrop, Wilson opposed the antinomian sentiments of John Wheelwright and Ann Hutchinson. He was chaplain to the troops sent against the Pequot Indians of Connecticut, 1636; was associated with John Eliot in his missionary labors among the Indians. He was distinguished for his benevolence and zeal. He published in England *Some Helps to Faith*. In America, *A Latin Poem to the Memory of John Harvard*; *The Day Breaking, if not the Sun Rising, of the Gospel*, relative to the Indians in New England.

WILSON, JOHN, famous as prof. Wilson, and the Christopher North of *Blackwood's Magazine*, was b. on May 18, 1785, at Paisley, where his father was a wealthy manufacturer. His earlier education he received in the house of Dr. M'Letchie, minister of the parish of Mearns, a wild moorland district in Renfrewshire, his boyish residence, which he long afterward commemorated in some of his most charming essays. After having been transferred for a time to the care of the rev. Joseph Macintyre of Glenorchy, in the Highlands, the love of which became for him a lifelong passion, he was sent to the university of Glasgow, where he remained for 4 years, distinguished as on the whole a diligent and successful, though somewhat fitful and irregular, student. In 1803 he went to Magdalen college, Oxford, where he became notable at once for the splendor of his intellectual gifts, and for his supremacy in the various athletic sports—boxing, rowing, running, etc.—which have always formed a not inconsiderable part of the education bestowed at the English universities. In 1806 he signalized himself by his Newdigate prize poem, *On the Study of Greek and Roman Architecture*; and the year after he took his degree of B.A., that of M.A. following in 1810. Meantime, he had left Oxford and settled himself in Cumberland, attracted partly by the beauty of the lake country and partly by a desire to cultivate the intimacy of Wordsworth, of whose genius he was already a devout admirer. He purchased the lovely little property of Elleray, where, for some years, he resided almost constantly. Besides Wordsworth, there were available in the district for intellectual converse De Quincey, Southey, and Coleridge (to whose *Friend* he contributed some essays). With all of them he became intimate; and when he wearied a little of "celestial colloquy divine" with them, he sought a variety to life in measuring his strength against that of the far-famed Cumberland wrestlers, the very sturdiest of whom has left it on express record that he found him "a vera bad un to lick." In 1810 he married a Miss Jane Penny, a Liverpool lady, of great personal attractions and much amiability of character, in his union with whom he found the main happiness of his life. He now seriously devoted himself to poetry and in 1812 published his *Isle of Palms*, which attracted considerable attention, and was followed, in 1816, by *The City of the Pagan*. This work showed a marked increase of power; but it is questionable, despite the grace, music, and tender feeling of much of his verse, whether, as a poet, Wilson would ever have succeeded in developing the real force of his genius. His true field, however, was found on the starting, in 1817, of *Blackwood's Magazine*. Some years previously a pecuniary disaster had befallen him; the fortune of £30,000 left him by his father being so seriously curtailed by the misconduct of a relative as to necessitate the breaking up of his establishment at Elleray. On this he transferred himself to Edinburgh, where, in 1815, he was called to the Scottish bar; but it does not appear that he had any opportunity of practice. As one of the briefless, with plenty of spare time on his hands, along with his friend Lockhart, then in similar case, he lost no time in proffering his aid to Mr. Blackwood. The astute publisher was at no loss to estimate the value of their alliance; and it is not too much to say that during its earlier years, Lockhart and Wilson were the soul of the success of the magazine. Presently, Lockhart was withdrawn to succeed Gifford as editor of the *Quarterly Review* in London; and Wilson, though never in any strict sense its editor—Blackwood himself throughout exercising a severe control—became, in the eye of the public, more and more identified with the magazine; in a certain modified, yet very real sense, to all intents for many years he was editor of the magazine, and under his famous pseudonym of Kit North, swayed it before the world. In 1820 he was appointed to succeed Dr. Brown, deceased, as professor of moral philosophy in the university of Edinburgh, his friend, sir W. Hamilton, being one of the defeated candidates. His real claims to such a post, though not to be compared with those of Hamilton—who, at that time, however, had given little or no

proof before the public of his consummate accomplishment and ability—have been somewhat unduly depreciated. They were not so by Hamilton himself, whose opinion it was, as reported by Mr. De Quincey, that “Wilson’s philosophic subtlety of intellect was not the least wonderful of his many wonderful gifts.” Thus much is certain, that as a professor, though somewhat desultory in his methods, he had an almost unexampled power of stimulating the enthusiasm of his students. Out of his class-room, however, it must be admitted he but indifferently succeeded in attaining the staid ideal proper to the learned and respectable class of men with whom he was thus somewhat oddly associated. He was the most “muscular” of “Christians,” and on more than one occasion the singular spectacle was exhibited of a Scotch professor of moral science taking off his coat in a public market-place to inflict personal chastisement on some ruffian, whose obnoxious proceedings had done outrage to his nicer sense of the fitness of things. Though sedulous and strict in his discharge of his duties as a professor, Wilson was loyal in his adhesion to Blackwood, and his contributions to the magazine, in their mere amount enormous, continued to form the main part of his activity. In 1840 he suffered an irreparable loss in the death of his wife. His grief for a while nearly prostrated him, and seems to have flung something of a shadow over what of life remained to him. He continued, however, to contribute to *Blackwood*, though now somewhat more intermittently; and in 1843 he published, as *The Recreations of Christopher North*, a selection, in two volumes, from the mass of his essays furnished to it. During the session 1852–53, he was smitten by an attack of paralysis, which permanently incapacitated him for the discharge of professorial duty; and in Edinburgh, on April 3, 1854, he died. During his last years he enjoyed a pension of £200 a year from government, in acknowledgment of his literary services. Besides his poetry and periodical writings, he published, in 1822, a volume of sketches, entitled *Lights and Shadows of Scottish Life*, which was followed the year after by his tale of *Margaret Lynulsey*. In these, as in his poems, the robust side of his mind is scarcely, if at all, represented; but the tender idyllic grace and charm by which they are pervaded, secured for them an extensive popularity, some portion of which they have since continued to retain. In his miscellaneous prose essays, critical and descriptive, and most especially in the celebrated series of dialogues entitled *Noctes Ambrosianæ*, the true power of his genius is revealed. Of the genius, there can be little question; though as to whether it has succeeded in embodying itself in forms which are likely to be permanent, there may reasonably be difference of opinion. The materials for judgment are before the world in the collected (or rather selected) edition of his miscellanies, published since his death by his son-in-law, prof. Ferrier. As a magnificent *potentially*, it is scarcely exaggeration to speak of Wilson along with Burns and Scott as a member of the trinity (so to speak) of Scottish literary genius. Certain it is, that nearly as effectually as they did, he stormed the heart of the Scottish people, and became, in his later years—the great novelist being gone—their idol and accepted literary representative. If he has left behind him no work sacred as his literary monument, thus much was almost involved in the conditions under which he wrote. Writing, as he did, from month to month, for the instant purpose of the hour, wise and steady concentration of his energies became more and more difficult for him. Not the less, when all reasonable deduction is made, he holds his place as one of the most notable literary figures in the earlier half of this century. His *range* of power is extraordinary; from the nicest subtleties of feminine tenderness, he passes at will to the wildest animal riot and the most daring grotesqueries of humor; and in what he terms “numerous prose,” the prose poem or rhapsody—a questionable and perilous, though, within wise limits, a legitimate form of art—he may be held, in his finer passages, to be at this day unrivaled. See the affectionate and felicitous *Memoir* by his daughter, Mrs. Gordon (1863). A selection from the *Noctes Ambrosianæ—Comedy of the Noctes Ambrosianæ*—by J. Skelton, appeared in 1876.

WILSON, Rev. JOHN, D.D., F.R.S., missionary, orientalist, and for many years one of the most influential Englishmen in Bombay, was born at Lauder, in Berwickshire, Dec. 11, 1804. Educated at Edinburgh university, he went in 1828 to Bombay as a missionary; and as a missionary—from 1843 onward in connection with the Free church of Scotland—he continued to labor zealously till his death, Dec. 1, 1875. But his early and thorough mastery of the languages of western India, his vast and scholarly command of the literature, the history, the faiths, and the social usages of the races of India, combined with his indomitable energy, practical sense, and insight into and sympathy with native feeling, enabled Wilson soon and long to exercise a wide and powerful influence usually denied to the missionary. He organized and extended the Scottish missions in western India; he promoted education, legal reform, the spread of toleration, and philanthropic movements of every kind; and was repeatedly trusted as a valued political adviser of the governor and governor-general, especially during the crisis of 1857. His linguistic labors, especially in Zend, were very memorable; and as a man Wilson was loved by all classes and races in the community. He was twice president of the Bombay branch of the Asiatic society, was vice-chancellor of the Bombay university, and a F.R.S. Among his writings other than those connected with his missionary work may be mentioned *The Parsi Religion* (1842); *The Lands of the Bible* (1847); and *India Three Thousand Years Ago*.

WILSON, JOHN LEIGHTON, D.D., b. S.C., 1809; graduated Union college, 1829; studied theology at the seminary, Columbia, S. C.; sailed as a missionary of the American board for Africa, 1833; was stationed eight years at cape Palmas, and twelve at Gaboon; reduced to writing the Grebo and Mpongwe languages; translated portions of the Bible, and prepared grammars and dictionaries; returned to the United States, and was elected one of the secretaries of the southern Presbyterian board of foreign missions. He has published *Western Africa, its History, Condition, and Prospects*; *The Agency devolving on White Men in Missions to Western Africa*; *The British Squadron on the Coast of Africa*.

WILSON, PETER, LL.D. 1746–1825, b. Scotland; educated at Aberdeen university. He came to the United States in 1763, and during the next 25 years was principal of academies at Hackensack, N. J., and Flatbush, L. I. He was an ardent patriot during the revolution, and served in the New Jersey legislature, 1778–83. He was professor of Greek and Latin in Columbia college, 1789–1820; published editions of the Greek Testament, and of Adams's *Antiquities*; and an *Introduction to Greek Prosody* (1811).

WILSON, RICHARD, an English landscape painter of eminence, was born in 1713 at Pinegas in Montgomeryshire. He at first devoted himself to portrait painting; but while studying in Italy in 1749 was advised to forsake portrait for landscape. To landscape painting he now exclusively devoted himself; and before returning to England in 1755, he had succeeded at Rome in establishing a considerable reputation. In London, in 1760, he exhibited his great picture, the "Niobe," and at once secured rank as one of the first painters of his time. Another celebrated work was his "View of Rome from the Villa Madama." Failing, however, to hit the general taste, he fell into the hands of the picture-dealers; and so straitened did he frequently find himself, that in 1770 he was happy to obtain the appointment of librarian of the Royal academy. By the death of a brother, who left him a handsome sum of money, he was rescued from indigence, and retiring to Llanberris in Denbighshire, he died there some few years after in 1782. Of his numerous pictures, now much prized, many are familiar to the public by engravings; in the National gallery, three very fine specimens of him may be found; and several others form part of the well-known Vernon collection.

WILSON, General Sir ROBERT THOMAS, was born in the year 1777 in London, where his father was a painter. He was educated at Westminster, and afterward at Winchester, and when scarcely 17 he joined the 15th light dragoons, then serving under the duke of York in Belgium, and took part in some sharp service, in which the regiment greatly distinguished itself. Shortly after his return to England, he was married to a lady of great beauty and some fortune, to whom, through life, he seems to have been ardently attached. In 1798, he was engaged in Ireland in the suppression of the rebellion; and the year after, he served in the unfortunate campaign of the Helder, and was present with his old regiment at the battle of Egmont-op-Zee. That in everything he proved himself a capable officer, may be inferred from his appointment soon after to command the small force of cavalry which served under sir Ralph Abercromby in Egypt. Here he formed a warm friendship with gen., afterward lord Hutchinson, who succeeded to the command of the army after the death of Abercromby. His next service was at the conquest of the cape of Good Hope in Jan., 1806, where again he commanded a small cavalry force. In the latter part of that year he went abroad on the staff of his friend, lord Hutchinson, who was sent on a mission to the king of Prussia, then a fugitive from his capital, and awaiting the result of the conflict pending between Napoleon and his allies, the Russians. Wilson had now, for the first time, an opportunity of seeing war on a really gigantic scale, being present at the desperate battle of Eylau (q.v.). The peace of Tilsit ensued, and Wilson thereupon returned to England. The struggle in the peninsula had now commenced, and Wilson was sent to take part in it; he was active in the embodiment and training of the Portuguese army, and subsequently, under Wellington, he commanded a Spanish brigade at the battle of Talavera. From this field of action he was, however, withdrawn; and in 1812, he was attached to the Russian army as English military commissioner. During the tremendous struggle which resulted in the capture of Moscow, and the operations which followed in pursuit of the doomed French army, he rendered important service both in council and in the battle-field; and he seems to have won the especial regard and confidence of the emperor Alexander. Throughout the subsequent campaigns in Germany, and those which followed in France, ending with the capture of Paris in 1814, he was present in a similar capacity in the camp of the allies. At Lützen, he took command of the Prussian reserve, and at a particular crisis of the battle, succeeded in severely checking the enemy. At Bautzen, he also distinguished himself; and a day or two after, the emperor of Russia presented to him publicly the cross of the order of St. George, saying that he gave it "as a memorial of his esteem for his courage, zeal, talent, and fidelity to my service." His services during this period will be found noted in every military history of the time; and they amply prove him to have been a most gallant and accomplished soldier.

After the peace, he became involved in the unfortunate matter of queen Caroline; and for his censure of the course pursued by government he was dismissed the army. He was afterward, however, re-instated. In 1841, he attained the rank of gen.; and

from 1842 to 1849, he held the post of governor of Gibraltar. In 1818, he had been returned to parliament in the liberal interest for Southwark, and he retained his seat till 1831. On May 9, 1849, having just returned from Gibraltar, he died suddenly in London. During his life he published several works; in 1804, *An Inquiry into the Military Force of the British Empire*; in 1811, *Campaigns in Poland, with Remarks on the Russian Army*; and in 1817, a *Sketch of the Military Power of Russia*. During his foreign campaigns, he kept copious private diaries; and of these, two most interesting volumes, "edited by his nephew and son-in-law, the rev. Herbert Randolph, M.A.," were some years since published by Murray of London. A *Life* of him has likewise been published by Murray under the same superintendence.

WILSON, THEODORE D., b. N. Y., 1810; became a shipwright and carpenter in the navy; and in 1863 was made inspector of the building and repairing of vessels about New York city. In 1866 he was appointed assistant naval constructor, and served in the Pensacola, Washington, and Philadelphia navy yards. He was afterward instructor in naval architecture and ship-building at the Annapolis academy, and in 1873 was promoted to be naval constructor. He has written *Ship-building, Theoretical and Practical*, a standard text book.

WILSON, Sir THOMAS, LL.D., 1524-81; b. England; educated at Eton and Cambridge, and took orders in the church of England. He was tutor to the sons of the duke of Norfolk by Mary ex-queen of France, and wrote their lives. He left England in 1553, and was confined in the prison of the inquisition till 1555. He returned to England when Elizabeth came to the throne, and became her private secretary in 1558. He was made ambassador to the Netherlands in 1576; became a secretary of state the next year; and dean of Durham in 1579. Among his works are: *The Arte of Rhetorique for the Use of all Such as are Studious of Eloquence* (1551), one of the earliest English treatises on rhetoric; and *A Discourse upon Usury* (1572).

WILSON, THOMAS, D.D., LL.D., 1663-1755; b. England; educated at Trinity college, Dublin; ordained minister of the church of England; curate of Winwicke, Lancashire, 1686; chaplain to the earl of Derby, 1692; traveled with lord Strange, 1694-97; elected bishop of Sodor and Man, 1698-1755. He was highly esteemed for piety and zeal. He published: *The Principles and Duties of Christianity*; *Short and Plain Instructions for the Better Understanding of the Lord's supper*; *The Knowledge and Practice of Christianity made Easy to the Meanest Capacities, or an Essay Toward an Instruction for the Indians*; *Sacra Privata*.

WILSON, WILLIAM DEXTER, D.D., LL.D., LL.H.D., b. N. H., 1816; entered the theological department of Harvard university, 1835; was ordained in the Protestant Episcopal church, 1842; published a volume whose final title, adopted on its republication in 1846, is *A Manual of Church Principles*; published several works on *Church Government and History*, 1847-49; made professor of history and of philosophy, intellectual and moral, in Geneva college, 1850; and of the last-named branches in Cornell university, 1868; and soon after published *Lectures on Psychology*; followed by volumes on *Metaphysics* and *Political Economy*, 1872; is the author of several monographs on mathematical and metaphysical topics, and of a history of philosophy. In his philosophy he pursues a line of thought between the two old schools of idealism and sensationalism, accounting for the element of knowledge in dispute between them by maintaining an *insight* into the nature of the things known. He regards logic as a science of things, of which words are only representatives. He restricts true causes to those that can be denoted by concrete terms, and on this basis constructs a transcendental logic which supplies a new method of studying ontology.

WILTON, a market t. and parliamentary borough in Wiltshire, at the junction of the Nadder and Wily, affluents of the Avon, $\frac{3}{4}$ m. w.n.w. of Salisbury. The new church, a magnificent Romanesque edifice, decorated in the richest and most tasteful manner, was erected in 1844 by the right hon. Sidney Herbert, at a cost of £20,000. The principal industry of the town is the manufacture of carpets, especially Axminsters, and the carpets called Saxony, made of short staple wool. The burgh returns one member to the house of commons. It is a station on the Salisbury branch of the Great Western railway. Pop. of parliamentary borough, '61, 8,657; '71, 8,865.

Wilton, a very ancient, and at one time important town, was the capital of the Anglo-Saxon kingdom of Wessex, and gave name to Wiltshire. From the 9th c. to the year 1214, it was a busy and prosperous place; but in that year the Great Western road, which had formerly passed through it on its way from Old Sarum, was diverted, and the prosperity of the town came to a close. The town stands near the site of a monastery given to sir William Herbert, first earl of Pembroke, by Henry VIII.; and the locality is rich in associations connected with the Herbert family. Here sir Philip Sidney wrote part of his *Arcadia*. The present mansion is noted for its collection of statues, and for its pictures, including several excellent Van Dycks.

WILTSHIRE, or WILTS (called by the Anglo-Saxons *Wiltonshire*, from their capital town, Wilton (q.v.), one of the south-western counties of England, bounded on the w. and n. by Somerset and Gloucester, and on the e. and s. by Berks, Hants, and Dorsetshire. Area, 859,303 acres; pop. '71, 257,177. The county is divided into two unequal

parts—the plains in the n., and the hill district, which comprehends the greater part of south Wiltshire; and the separation between these two parts is very nearly that of the main line of the Great Western railway, the course of which across the county is from n.e. to s.w., past Swindon and Chippenham. The plains incline n. to the basin of the Thames, which forms in part the northern boundary, and are noted for their agricultural capabilities. The surface of this district is checkered with corn-fields and rich pastures, and here the cheeses for which Wiltshire is favorably known are produced. The hill district (on the chalk) presents ranges of bleak downs, with deep valleys, and is thinly peopled, much of it consisting of solitary sheep-walks, on which it is estimated 700,000 sheep are pastured. Inkpen Beacon, 1011 ft. high, at the junction of Wiltshire, Hampshire, and Berkshire, is the nucleus whence proceed the North and South downs of Surrey and Sussex, and the hills which, running s. through this county, become the North and South downs of Dorsetshire. Agriculture is carried on with the assistance of modern improvements; many swine are reared, and Wiltshire bacon is famous. Portland stone is quarried at Swindon, Tisbury, and in other localities; and a fine oolite, known as Bath stone, is extensively worked at Box and the neighborhood; and a stone called forest marble yields coarse tiles and flagstones, and often retains in perfect preservation “the ripple-marks of waves and the footprints of crustaceans.” The manufacture of woven goods, carpets, and other woolen goods, silks and linens, is carried on at Trowbridge, Wilton, Bradford, Devizes, Westbury, etc. There are iron mines and blast-furnaces at Westbury and Seend, and Swindon is one of the greatest railway workshops in the kingdom. The principal rivers are the Thames, with its tributary, the Kennet; the Bristol Avon (which communicates with the Thames and Severn by the Wilts and Berks canal, and again with the former by the Kennet and Avon canal), and the Salisbury Avon, with four tributaries spreading over the whole of south Wiltshire. The county sends four members to the house of commons, and the boroughs 14 more. Before 1832, Wiltshire had 34 members. Capital, Salisbury; but the assizes are held alternately there and at Devizes.

Wiltshire abounds in early and interesting antiquities. Among these may be mentioned its Druidical temples (see AVEBURY and STONEHENGE), British intrenchments, roads, and villages, barrows (in which beads, rude axes of stone, arrow-heads of flint, and sometimes articles in gold, brass, or iron, have been found along with the relics of mortality), Saxon encampments, Roman roads and Norman castles, of which there are many remains. Longleat, Wilton, Bowood, Stourhead, and Corsham are the most remarkable modern houses of the nobility.—See *History of Ancient Wiltshire*, by sir R. C. Hoare.

WIMPFEN, EMANUEL FELIX DE, b. Laon, France, 1811; entered the army and distinguished himself in the Algerian wars. In 1855 he was made brig.gen. of the imperial guard, and in 1859 gen. of division. He was commandant at Lyons, and later governor of Algiers and Oran. In the Franco-Prussian war he was at the head of the 12th and 5th army corps, took the chief command at Sedan after MacMahon was wounded, and signed the capitulation. Since the close of the war he has resided in Algiers.

WINCHELL, ALEXANDER, LL.D., b. N. Y., 1824; educated at Wesleyan university. He was appointed professor of physics and civil engineering at Michigan university in 1853, and held the chair of geology, zoology, and botany at the same institution, 1855-72, when he was elected chancellor of the Syracuse university. He resigned in 1874, retaining the position of professor of geology and zoology, and becoming special lecturer at Vanderbilt university, with which he has since severed his connection. Among his works are: *Sketches of Creation; The Doctrine of Evolution; Reconciliation of Science and Religion; and Preadumites*.

WINCHESTER, a city of Virginia, in the valley of the Shenandoah, 150 m. n.n.w. of Richmond; 67 m. w. by n. from Washington; 32 m. by railway to Harper's Ferry. It has 15 churches, an academy, two newspapers, manufactures of shoes, gloves, furniture, soap, etc. Mar. 12, 1862, it was occupied by the federal gen. Banks, and was during the war the scene of frequent conflicts, and occupied in turn by the federal and confederate armies. Pop. '70, 4,477.

WINCHESTER, a famous historical city, and parliamentary and municipal borough, chief t. of Hampshire, is situated in the middle of the county, on the right bank of the Itchen, 67 m. s.w. of London by railway, and 60 in a direct line. It consists of one main street, crossed by a number of streets running at right angles to it, and was in early times surrounded by a wall, of which remains exist. The houses for the most part spread over a hill rising from the valley of the Itchen; but the cathedral, and some of the older and more interesting portions of the city, stand on level-ground close to the river-bank. The Castle-hill is the site of the old castle or royal palace, built in the 13th c. by Henry III., and of a magnificent hall, of which the only remaining portion is used as the county court. About a mile from the town is the famous hospital of St. Cross, founded in 1136 by a bishop of Winchester, Henry de Blois, for 13 poor men, “decayed and past their strength.” It was munificently endowed; but its sources of income have been narrowed, and its ancient charters and grants were destroyed during the 13th century. Its income is above £1000 per annum, and it supports 13 poor brethren, affords

relief to a number of external poor, and distributes general doles on the eves of great festivals. The hospital is entered by a gateway, after passing which a pleasing view is obtained of the buildings, which occupy three sides of a quadrangle, the fourth side being occupied by a neat, picturesque, ancient church in transition Norman, which formed part of the institution. There is a city library and a museum; the latter contains some very interesting local antiquities. Charles II. commenced a palace here, but the part completed is now used as barracks. The city cross in the High street, dating from the 15th c., is very beautiful in design.

The college of Winchester, originally called "Seinte Marie College of Wynchestre," now Saint Mary's or Winchester college, was founded by William of Wykeham, bishop of Winchester, in 1387, and the buildings were completed in 1393. The buildings are, for the most part, of the age of the founder, and consist of two quadrangles and a cloister, together with recently erected houses for the commoners. The famous *Dulce domum* is sung by all the boys in the courts of the college before the breaking up of the school at the long vacation. The foundation consisted originally of a warden, 10 fellows, 70 scholars, a head-master (*informator*), an usher (*ostiarium*), or second master, 4 chaplains, 3 clerks or singing-men, and 16 choristers. By an ordinance of the Oxford university commission, which took effect in 1857, the number of fellowships has been reduced, as vacancies occurred, to 6, the number of scholars being increased to 76, and 8 exhibitions have been founded. The charter of the school, which is in existence, was granted by Richard II. in 1396, and confirmed by all the subsequent sovereigns, Mary excepted, down to Charles II. The visitor is the bishop of Winchester, and the warden and two fellows of New college, Oxford, hold an annual "scrutiny," which, however, is generally merely formal. The endowment, which amounts at present to about £15,500 annually, consists of landed property and funded stock; and of this about £2,600 goes to expenses of management. The warden and fellows are the governing body of the college. The pupils of the school are of two classes—foundation scholars and commoners. The scholars are elected, between 10 and 14 years of age, by competitive examination; the average annual number of vacancies being 12, and the number of candidates 100. The scholars are well boarded, lodged, and educated, at the expense of the foundation; having to pay, for some incidental charges, books, medical attendance, etc., about £30 per annum; but tradition exercises a powerful influence at Winchester, and many of the quaint old customs of the school, such as dining off wooden trenchers, etc., are still retained. The number of the commoners has fluctuated much; but owing to the better position in which they were placed by the new regulations of 1857, they have averaged 300 annually for some years; they generally enter between 11 and 16 years of age, and stay 3 to 4 years, and not being foundation-boys are boarded in the houses of the head and other masters, at a total annual cost of about £135 (including expense of tuition, pocket-money, and cost of traveling). Winchester possesses 15 fellowships and 30 scholarships at New college, Oxford (also founded by William of Wykeham), open to scholars and commoners alike, and tenable for five years, besides numerous other prizes. Fagging is permitted to the 18 chief boys, who are called "prefects." The monitorial system was first established in this college.

A church is said to have been built at Winchester in the year 169; to have been destroyed in 266, restored in 293, and converted into "a temple of Dagon" (by whom we are to understand Wodin) by the Saxons under Cerdic in 495. In 635, the polluted church was pulled down, and a new one commenced, under the superintendence of Birinus, the first apostle of Wessex; and king Kynegils granted the whole of the land for the space of 7 m. round the city for the support of the episcopal seat and the re-established monks. From the year 674, the succession of bishops of Winchester, of which the celebrated St. Swithin (see SWITHIN, St.) was one, continues unbroken. Of Birinus's cathedral, however, in which most of the Saxon kings of Wessex (see HEPTARCHY) were interred, and on the altar of which, according to tradition, king Canute hung up his crown after the well-known scene on the sea-shore, no portion remains, and a new cathedral—the present one—was built "from the foundations" by Bishop Walkelin (1070-1097); and after its completion, and the removal into it of the precious relics of Birinus's cathedral, that old edifice was pulled down. William of Wykeham was bishop of Winchester from 1367 to 1404, and has more closely than any other bishop associated his name with his episcopal city and its cathedral. He greatly enlarged and beautified the building, and he began the remarkable transformation of the nave from Norman to perpendicular. The cathedral is 520 ft. long, longer than any other English cathedral, with the exception of those of Ely (560 ft.), and Canterbury (525 ft.). Its breadth at the transepts is 208 ft., the length of its nave is 351 ft., its height 86 ft., and a low central Norman tower 150 ft. high. The exterior is somewhat disappointing, owing to its unusual want of decoration, and to the lowness of the tower; but the interior is magnificent, and contains many objects of the highest interest—as the tomb of William Rufus; bronze figures of Charles I. and James I.; mortuary chests which contained the ashes of a number of west Saxon kings and bishops, but which were rifled during the civil war; the golden shrine of St. Swithin, with some excellent specimens of sculpture, both ancient and recent; the tomb of Edmund, the son of king Alfred, and the tomb of Izaak Walton. The various architectural styles to be noted in the cathedral are: Early Norman in the crypt and transepts; early English in the eastern aisles

and chapels behind the presbytery; decorated in the piers and arches of the presbytery; and perpendicular in the nave, which, for beauty and grandeur, is only rivaled by York. After the cathedral, there are some churches of interest in the transition Norman and perpendicular styles; and there are many other buildings of a religious and educational kind. The industries of Winchester are unimportant. Pop. of municipal and parliamentary borough, '71, 13,366, represented by two members.

Winchester, the Roman *Venta Belgarum*, was the site of a British city before the arrival of the Romans in Britain, *Cuer-Gwent* (*gwent* = champaign or down). It afterward became a Roman station, and, as such, was a place of considerable importance, and contained temples of Apollo and Concord. When taken by the Saxons in 495, it is said to have contained at least one Christian church. The Saxons called the town Wintanceaster. As the capital of Wessex, Winchester became the capital of England, and even after the Norman conquest was long a chief royal residence. In 1265, during the barons' war, Winchester was sacked, and it never again recovered its commercial prosperity. From the time of Charles II., the town has gradually declined—its chief sources of life and movement being the cathedral and the college.

WINCHESTER, ELHANAN, 1751-97; b. Mass.; joined the open communion Baptists. Canterbury, Conn., 1770; ordained pastor of a church, Rehoboth, Mass., 1771; became a close communionist and was excommunicated by his church; resided in South Carolina, 1774-80; pastor of first Baptist church, Philadelphia, 1780; became a preacher of universal restoration, and with a majority of his people formed a new church; went to England, 1787, remaining till 1794, preaching with great success, and publishing various works; returned to America. He published *Five Letters on the Deity of Christ*; *Beauties of the Millennium*; *The Face of Moses Unveiled*; *Ten Letters to Thomas Paine*; *Hymns on the Restoration*, and numerous other works. He was a forerunner of the present Universalist denomination.

WINCING MACHINE, the wheel used by dyers for winding out of their dye-vats long pieces of cloth. The vat is often divided by a partition, and the wincing-machine is generally so placed that it will wind the piece of cloth from one compartment to the other, according to the direction given to the handle.

WINCKELMANN, JOHANN JOACHIM, well known as the critical expounder and historian of ancient classical art, was born of poor parents in the year 1717, at Stendal, in Prussia. He very early showed an eager desire for knowledge, and being sent to the free school of the place, became so special a favorite with the rector of it, that he was taken into the rector's house as a companion, when age and blindness made some assistance necessary to him. After studying for a time in Berlin, he went, in 1738, to the university of Halle, where he remained two years engaged in the study of theology, which, however, he found so distasteful that, at the end of that time, he relinquished it, accepting a situation as tutor in a private family at Osterburg. In 1743, he became a schoolmaster at Seehausen—a wretched position, from which he was rescued by the count von Bülow, who employed him as secretary in his library at Nothenitz. Here he remained some years. Being in the vicinity of Dresden, he had frequent opportunities of inspecting the famous treasures of art accumulated there. He also made the acquaintance of some artists of eminence, among others, the well known Oeser; and the enthusiasm was awakened which determined his subsequent career. To the theory and history of art he now resolved to devote himself; and on being thrown into the society of the pope's nuncio, cardinal Archinto, he was induced, after some hesitation, to become a Roman Catholic, on a promise of a pension being procured for him, to enable him to proceed to Rome. Thither he repaired in 1755, having previously published at Dresden a treatise, entitled *Gedanken über die Nachahmung der Griech. Werke*, etc. (Reflections on the Imitation of the Antique, 1754). Of this work he issued, in 1756, a new and enlarged edition. At Rome he prosecuted his studies with the utmost ardor, and every facility was afforded him. In 1758, he visited Naples, to examine the celebrated remains of Herculaneum, Pompeii, and Pæstum; and went also to Florence, for the purpose of cataloguing the famous collection of antique gems belonging to baron de Stosch, a labor which occupied him for nine months. Soon after, the cardinal Albani appointed him his librarian, and the salary attached to this post, with the pension continued from Dresden, in itself a somewhat meager pittance, enabled him to prosecute his studies in comfort. The first-fruit of these appeared in his treatise, entitled *Anmerkungen über die Baukunst der Alten* (Remarks on the Architecture of the Ancients), which was printed in Germany in 1762; and two years afterward, the great work of his life, on which he had been long engaged, the celebrated *Geschichte der Kunst des Alterthums* (History of Ancient Art), was issued from the press of Dresden. In 1767 a supplement to it was added. He also gave to the world the result of his researches at Herculaneum; and in 1766, his *Monumenti Antichi Inediti*, an elaborate work with plates.

In 1768, Winckelmann, by this time famous throughout Europe, set out to revisit Germany. His destination was Berlin; but on the way, a strange yearning seized him for the Italy he had left; on his reaching Munich, it was no longer to be resisted; and he started thence on his return to Rome. He went by Vienna, where the most flattering attentions were paid him; proceeding thence to Trieste, where he came by his tragic

end at the hands of a fellow-traveler, by name Francesco Arcangeli, who murdered him in order to plunder his effects. In this he did not succeed, being scared almost in the act, and presently caught and executed.

Winckelmann was the forerunner of a great movement; and his influence has been deeply felt in all the subsequent literature of the subject to which he devoted himself. Even at this day, when a good deal of it is regarded as obsolete, his great *History* remains as a work not to be neglected by any one seriously concerning himself with the study of this branch of aesthetics. The most complete edition of Winckelmann's works is Fernow, Meyer, and Schultz's (8 vols. new ed. 1828). See the life of Winckelmann by Justi (1866-73).

WINCKELRIED. See MELCHTAL. ARNOLD VOM.

WIND is the air in motion. The force of the wind is measured by anemometers (q.v.), of which some measure the velocity, and others the pressure. The following are a few velocities of wind, translated into popular language: 7 m. an hour is a gentle air; 14 m., a light breeze; 21 m., a good steady breeze; 40 m., a gale; 60 m., a heavy storm; and 80 to 150 m., a hurricane sweeping everything before it. We also add a few comparisons of velocity and pressure: 5 m. an hour is a pressure of 2 oz. on the sq.ft.; 10 m., $\frac{1}{2}$ lb.; 20 m., 2 lbs.; 30 m., $4\frac{1}{2}$ lbs.; 40 m., 8 lbs.; 51 m., 13 lbs.; 60 m., 18 lbs.; 70 m., 24 lbs.; 80 m., 32 lbs.; and 100 m., 50 lbs. During the severe storm which passed over London, on Feb. 6, 1867, the pressure was 35 lbs. to the sq. ft., corresponding to a velocity of 83 m. an hour. A pressure of at least 70 lbs. to the sq.ft. has since been recorded at the Liverpool observatory. Wind is most frequently measured by estimation.

Seamen require more than landmen to pay attention to every variation in the strength of the wind, as well as its direction, and to adopt such phrases as will render that strength generally intelligible. The *anemometer* (q.v.), which is used on land for this purpose, is unsuited to the wants of seamen. They have found it convenient to divide winds into 12 kinds, in relation to strength, designated thus: *Faint air, light air, light breeze, gentle breeze, fresh breeze, gentle gale, moderate gale, brisk gale, fresh gale, strong gale, hard gale, and storm*. This classification was determined in 1806 by Beaufort according to the amount and kind of sail which one of her majesty's ships could safely carry at the moment. The estimate of the wind's force by the scale 0 to 12, means that 0 represents a calm, and 12 a hurricane. If such estimations be divided by 2, and the quotient squared, the result will be the pressure in pounds, approximately.

All wind is caused, directly or indirectly, by changes of temperature. Suppose the temperature of two adjacent regions to become, from any cause, unequal, the air of the warmer, being lighter, will ascend and flow over on the other, while the heavier air of the colder region will flow in below to supply its place. Thus, then, a difference in the temperature of the two regions gives rise to two currents of air—one blowing from the colder to the warmer along the surface of the earth, and the other from the warmer to the colder, in the upper strata of the atmosphere; and these currents will continue to blow till the equilibrium be restored.

Winds are classed into *constant, periodical, and variable winds*.

CONSTANT WINDS. *The Trade-winds.*—When the surface heated is, roughly speaking, a whole zone, as in the case of the tropics, a surface-wind will set in toward the heated tropical zone from both sides, and uniting will ascend, and then separating, flow as upper currents in opposite directions. Hence, a surface-current will flow from the higher latitudes toward the equator, and an upper current toward the poles. If, then, the earth were at rest, a n. wind would prevail in the northern half of the globe, and a s. wind in the southern half. But these directions are modified by the rotation of the earth on its axis from w. to east. In virtue of this rotation, objects on the earth's surface at the equator are carried round toward the e., at the rate of 17 m. a minute. But as we recede from the equator, this velocity is continually diminished; at lat. 60°, it is only 8½ m. a minute, or half of the velocity at the equator; and at the poles it is nothing. A wind, therefore, blowing along the earth's surface to the equator, is constantly arriving at places which have a greater velocity than itself. Hence, the wind will lag behind, that is, will come up against places toward which it blows, or become an *east* wind. Since, then, the wind n. of the equator is under the influence of two forces—one drawing it s., the other drawing it w.—it will, by the law of the composition of forces, flow in an intermediate direction, that is, from n.e. to s.west. Similarly, in the southern tropic, the wind will blow from s.e. to n.west. All observation confirms this reasoning. From the great service these winds render to navigation, they have been called the trade-winds. It is only in the Pacific and Atlantic oceans that the trade-winds have their full scope. In other parts of the trades' zone, such as southern Asia and intertropical Africa and America, they are more or less diverted from their course by the unequal distribution of land and sea (on which see Monsoon). It is generally stated that in the Atlantic the *north trades* prevail between lat. 9° and 30°, and in the Pacific, between lat. 9° and 26°; and the *south trades*, in the Atlantic, between lat. 4° n. and 23° s., and in the Pacific, between lat. 4° n. and 23½° south. These limits, however, are not stationary, but follow the sun, advancing northward from January to June, and southward from July to December.

Region of Calms.—This is a belt, 4° or 5° broad, stretching across the Atlantic and Pacific, parallel to the equator. It marks the meeting-line of the n. and s. trades, where they mutually neutralize each other. Here also occur heavy rains, and thunderstorms almost daily. This belt varies its position with the trades, reaching its most northern limit in July, and its most southern in January. When the belt of calms nears the African coast, in the gulf of Guinea, the copious rainfall gives rise to the strong steady-blowing gales of that coast, called *tornadoes*.

PERIODICAL WINDS. Land and Sea Breezes.—These are the most general, as well as most easily explained, of the periodical winds. On the coast, within the tropics, a breeze sets in from the sea in the morning, at first a mere breathing on the land, but gradually it increases to a stiff breeze in the heat of the day, after which it sinks to a calm toward evening. Soon after, a contrary breeze springs up from the land, blows strongly seaward during the night, and dies away in the morning, giving place to the sea-breeze as before. These winds are caused during the day, by the land getting more heated than the sea, consequently the air over it ascends, and the cool air from the sea flows over on the land to supply its place; and during night, by the temperature of the land falling below that of the sea, and the air becoming thereby heavier and denser, flows over the sea as a land-breeze. It is within the tropics where sea-breezes are most marked and constant, because there the sun's heat is greatest, and atmospheric pressure is practically uniform, except in those rare instances where it is disturbed by hurricanes. But in countries such as Great Britain, where atmospheric pressure is most commonly, to some extent, greater or less than that of surrounding regions, the strength of the wind blowing from the high to the low barometer is far stronger than that which would result from the disturbance caused by the unequal heating of land and water; and consequently the sea-breeze is not felt. In the warm months, however, when barometers are nearly uniform over northern and western Europe, there is a gentle sea-breeze all round Great Britain during the heat of the day, and a land-breeze during night. Thus on the coast of Berwickshire, during fine settled summer weather, when the temperature of the land is much warmer than that of the sea during the day, in the morning the wind is n.w. till about 10 A.M., when it veers to n., falling all the time, till finally it sinks to a calm. A little before noon it springs up from n.e. or e., veers to s.e. from 2 to 3 P.M., where it continues till 7 P.M., when it veers to s. and s.w., and gradually sinks to a calm. About sunset it springs up from w. and veers to n.w. during the night, where it continues till next morning. On the other hand, on the w. coast of Scotland, n.w. winds diminish in force toward sunset, giving rise to the weather saying: "The w. wind is a gentleman and goes to bed." Quite analogous to the land and sea breezes are the monsoons (q.v.), which are only the n. trades drawn out of their course in summer by the heated regions of southern Asia—the s.w. monsoon being only a vast sea-breeze blowing on southern Asia, and continuing several months of the year.

VARIABLE WINDS.—These winds depend on purely local or temporary causes, such as the nature of the ground, covered with vegetation or bare; the physical configuration of the surface, level or mountainous; the vicinity of the sea or lakes; and the passage of storms. Within the tropics, all except the last of these is borne down, or all but borne down, by the great atmospheric currents, which prevail there in all their force. But in higher latitudes this is not the case; these, therefore, are the regions where variable winds prevail. The most noted of these winds are the simoon (q.v.), sirocco, solano, and harmattan (q.v.). The *bora* is a cold tempestuous wind, blowing from the Alps down on the Adriatic; and the *gregale* is a peculiarly cold, parching, and unhealthy wind, which at certain seasons descends on Malta from Greece. The *puna winds* prevail for four months in the year in a high barren table-land in Peru called the puna; as they are part of the s.e. trade-wind, after having crossed the Andes they are drained of their moisture, and are consequently the most dry and parching winds that occur anywhere on the globe. In traveling over the puna it is necessary to protect the face with a mask from the glare and heat of the day, and from the intense cold of the night. The *east winds* which prevail in the British islands in spring are part of the great northern current which at that season generally descends over Europe through Russia. Their origin explains their dryness and unhealthiness. It is a prevalent notion that the e. winds in this country are damp. It is quite true that many easterly winds are peculiarly damp; all that prevail in the front part of storms (q.v.) are very damp and rainy, they being simply an indraught of the air toward the low barometer which is advancing from the w. at the time; and it is owing to this circumstance that in the e. of Scotland the greater part of the annual rain-fall falls with easterly winds. All of these damp easterly winds, however, soon shift round to some westerly point. But the genuine e. wind, which is the dread of the nervous and of invalids, does not shift to the w., and is specially and intolerably dry. In the third week of May, 1866, this character was strongly marked, when at many places in Scotland the humidity was only 49, and on some occasions as low as 29; the degree of this dryness will be appreciated when it is stated that the driest month during eleven years ending with 1866, showed a humidity only of 73, saturation being 100. While this wind lasted, the daily range of temperature was double the usual amount, the soil was parched, and the leaves of trees and plants were blackened and destroyed. Deaths from brain-diseases and consumption reach the maximum in Great Britain during the prevalence of e. winds. The *tesian winds* are northerly winds which prevail in sum-

mer on the Mediterranean. They are probably caused by the great heat of North Africa at this season, and consist in a general flow of the air of the cooler Mediterranean to the s., to take the place of the heated air which rises from the sandy deserts. The *mistral* is a steady, violent n.w. wind, felt particularly at Marseille and the s.e. of France, blowing down on the gulf of Lyons. The *pampero* blows in the summer season from the Andes across the pampas of Buenos Ayres to the sea-coast. It is thus a n.w., or part of the anti-trade of the southern hemisphere, and so far analogous to the stormy winds which sweep over Europe from the s.w. But since it comes from the Andes over the South American continent, it is a dry wind, frequently darkening the sky with clouds of dust, and drying up vegetation.

Lord Bacon remarked that the wind most frequently veers with the sun's motion, or passes round the compass in the direction of n., n.e., e., s.e., s., s.w., w., and n.w. to north. This is from the fact that by far the greater proportion of the storms of north-western Europe follow their course to eastward along paths lying to the n. of the British islands. The late prof. Dove of Berlin first propounded the *Law of the Rotation of the Winds*, and proved that the whole system of atmospheric currents—constant, periodical, and variable winds—obey the influence of the earth's rotation.

WINDAGE, in a gun, the difference in diameter between the bore of the piece and the projectile with which it is loaded. Formerly, a considerable windage was allowed; but this only served to diminish the force of the explosion, and to give an irregular motion to the shot. In the present rifled artillery, it is sought to reduce the windage to a minimum, as .01 of an inch. Some windage is indispensable, or the shot would jam either going in or coming out.

WINDAGE (from cannon-balls), or **WIND CONTUSIONS**. Military surgeons so often meet with cases in which serious internal mischief (as for instance, the rupture of the liver, concussion of the brain, or even a comminuted fracture of a bone) has been inflicted, without any external marks of violence to indicate its having resulted from the stroke of a cannon-ball, that they were led to the conclusion that solid objects projected with great velocity through the air might inflict such injuries indirectly by aerial percussion; the hurt being inflicted either directly by the force with which the air is driven against the part, or indirectly by the rush of air to re-fill the momentary vacuum created by the rapid passage of the ball. So many observations have, however, been made of cannon-balls passing close to the body (even shaving part of the head, tearing away portions of uniform, or carrying off the external ear or the end of the nose, without further mischief), that this hypothesis is totally untenable, and is now generally rejected. The true explanation of the cases formerly attributed to the windage of cannon-balls appears to rest, according to recent views, "in the peculiar direction, the degree of obliquity with which the missile impinges on the elastic skin, together with the situation of the structures injured beneath the surface, relatively to the weight and momentum of the ball on one side, and hard resisting substances, on the other." See Longmore's article on "Gun-shot Wounds" in Holmes's *System of Surgery*, vol. ii. pp. 18-20, where the subject is fully discussed.

WINDERMERE. WINANDERMERE, or LAKE WINDER, the largest lake in England, called on account of the supposed superiority of its shores, in point of natural beauty, over those of the other lakes of north-western England, the "Queen of the Lakes," is partly in the co. of Lancaster, and partly divides that co. from Westmoreland. It is 11 m. long, and about 1 m. in extreme breadth, is fed by the Brathay and the Rothay, the waters of which become united before entering the lake, and by the streams which drain the neighboring lakelets of Esthwaite, Troutbeck, and Blelham, and discharges its surplus waters southward into Morecambe bay by the Leven. Next to West Water, Windermere is the deepest of all the English lakes, its greatest depth being 240 ft. deep, while West Water is 270 ft. deep. It contains a number of islands, the largest being 28 acres in superficial extent, and the chief of which are Rough Holm, House Holm, Lady Holm and Curwen's or Belle Isle. Soft rich beauty is the principal characteristic of the islands of the lake, of the wooded shores, and of the scenery around; there being a total absence of that wildness and sublimity which characterizes some of the other lakes, except at the n. end, where Langdale Pikes, Harrison Stickle, Sea Fell, and Bow Fell stand forward prominently in the landscape. The e. and w. shores are bounded by gentle eminences exuberantly wooded, and numerous villas and cottages peeping out of the woods give an aspect of quiet domesticity to the landscape. About 1 m. from Waterhead, at the n. extremity of the lake, is the town of Ambleside, 1½ m. n.w. of which is Rydal, the residence of the poet Wordsworth; in the vicinity of Waterhead is Dove's Nest, the cottage at one time occupied by Mrs. Hemans; further down the e. shore is Elleray, famous as the residence of "Christopher North;" and half-way down the lake, on the eastern shore, is Bowness.

WIND-FLOWER. See ANEMONE, *ante*.

WINDGALLS are puffy swellings about the joints of animals, particularly of horses, correspond to the ganglions of human surgery, and result from irritation and inflammation being set up within the delicate synovial cavities, which thus secrete an unusual quantity of thickened synovia. Rest, moderate work, wet bandages, and occasional

blisters reduce the swellings, but with fast readwork they are apt to re-appear, especially in old horses.

WINDHAM, a co. in n.e. Connecticut, bordering on Massachusetts; 550 sq. m.; pop. '80, 43,857—33,125 of American birth, 551 colored; drained by the Quinebaug, Shetucket and other rivers. Its manufactures are important; value of cotton goods manufactured in one year, \$5,608,668. Co. seat, Brooklyn.

WINDHAM, a co. in s.e. Vermont, bordering on Massachusetts and New Hampshire, having the Connecticut river for its e. boundary, drained by the West and Deerfield rivers; 750 sq. m.; pop. '80, 26,762—25,246 of American birth, 89 colored. Its mineral resources are important, embracing gneiss, limestone, slate, and granite. Co. seat, Fayetteville.

WINDHAM, Right Hon. WILLIAM, English statesman, b. 1750, in Golden square, London, was son of col. Windham of Felbrigg hall, Norfolk, in which county the family had been settled since the 12th century. He was educated at Eton, and was afterward sent to Glasgow university, where he studied mathematics with success. In 1761 he entered at University college, Oxford. After the usual course of travel, he began to acquire notoriety as an opponent of the administration of lord North. Historical exercises were interrupted by a design of visiting the north pole, and he accompanied the expedition in which Nelson, then a youth, took part. He found the sea-sickness intolerable, was put on shore in Norway, and returned home in a Greenland whaler. In 1781 he was returned to parliament for Norwich, and took his seat among the whigs. In 1783, on the formation of the Portland ministry, remarkable for the coalition of lord North and Mr. Fox, he became principal secretary to lord Northampton, then lord-lieutenant of Ireland. Before leaving England, he called upon his friend Dr. Johnson, and lamented that his situation would compel him to sanction practices he could not approve. "Don't be afraid, sir," replied the doctor, "you will soon make a very pretty rascal." Ill-health, or, perhaps, conscientious scruples, soon caused him to resign his secretaryship. In 1784 he seconded Burke's motion for a representation to the throne on the state of the nation. There is an admirable and characteristic sketch of Windham in Macaulay's description of the trial of Warren Hastings: "There, with eyes momentarily fixed on Burke, appeared the first gentleman of the age, his form developed by every manly exercise, his face beaming with intelligence and spirit—the ingenious, the chivalrous, the high-souled Windham." Abandoning his old friends the whigs, he followed Mr. Burke, and ranged himself on the side of Mr. Pitt in opposing the speculative doctrines of the French revolution, and supporting the war with France. In 1794 he became secretary-at-war under Mr. Pitt, with a seat in the cabinet. He now attacked his former friends with the utmost ascerbity. He went out with Pitt in 1801, and sided with the Grenvilles in stigmatizing the peace of Amiens, concluded by the Addington administration in 1801. This lost him his seat for Norwich, but he was elected for St. Mawes, and, on the return of the Grenville party to power, he became colonial secretary. In 1806 he brought forward his plan of limited service in the army, proposing that the infantry should be enlisted for seven years only, with liberty to renew their services for another seven years, receiving an increase of pay; cavalry and artillery to be enlisted for ten years, the second period six, and the third five years. He also proposed to increase the pay and pensions of officers and men, and generally to better the condition of the soldier. The plan was strenuously opposed, but passed into a law. He went out of office in 1807, when the Portland administration was formed (having previously declined the offer of a peerage), and strongly denounced the expedition against Copenhagen, and afterward the disastrous Walcheren expedition. In 1808 a clause was introduced by lord Castlereagh (who had succeeded Windham in office) into the mutiny act, permitting men to enlist for life, contrary to Windham's scheme of limited service, which was, however, readopted in 1847. In May he underwent a surgical operation for extracting a tumor from his hip, from the effects of which he died June 3, 1810.

Windham was an excellent speaker, and one of the most effective and skillful debaters of his time, as will appear from his speeches collected by Mr. Amyott, his secretary, and published, with a life prefixed, in 3 vols. 8vo. Fox said he had never met a meditating man with so much activity, or a reading man with so much practical knowledge. Pitt declared that his speeches were the finest productions possible of a warm imagination and fancy. Canning described his eloquence as, if not the most commanding, at least the most insinuating that was ever heard in the house of commons. Dr. Johnson, who was much attached to him, declared that, in the regions of literature, Windham was *inter stellis luna minores*. He possessed brilliant conversational powers. Yet, notwithstanding his great talents and rare gifts, he appears in the page of history as the mere shadow of a man. In his lifetime he gained the disparaging nickname of "the weathercock." He was fond of paradox, and once defended bull-baiting in the house of commons with great vivacity and ingenuity. Although a man of refinement and sensitiveness, he had a passion for pugilism, and was a regular attendant upon prize-fights. The publication of his *Diary from 1784 to 1810*, by Mrs. Henry Baring (1866) discloses the secret of his weakness. Morbidly self-conscious, he was always watching himself, pulling himself to pieces, and recording the doubts that haunted him as to his mental capacity. Acknowledged by his contemporaries to be one of the manliest of men, he

succeeded in infusing into his mind doubts with respect to his own courage. He got rid of this delusion by going under fire in the trenches at the siege of Valenciennes; but no sooner was he convinced that he was not a coward than he began to be afraid he was discreditably insensible to the scenes which were passing around him! With brilliant faculties, he was in fact an intellectual hypochondriac incapable of achieving anything great.

WINDHORST, LUDWIG, b. Prussia, 1812; educated at Göttingen and Heidelberg. He was called to the bar, became syndic of the Osnabrück consistory, and finally chief syndic of the crown in Kalbe. He was minister of justice at Hanover, 1863-65; a member of the assembly of the states of the realm, 1849-66; and president of its second chamber in 1851. He was elected to the reichstag, and in 1867 to the Prussian house of deputies. He is the parliamentary leader of the Prussian Roman Catholics.

WIND INSTRUMENTS, musical instruments of which the sounds are produced by the agitation of an inclosed column of air. They are generally classified into *wood instruments* and *brass instruments* (both of which are played by the breath), and the *organ*.

The name wood instruments is applied to musical instruments constructed either of wood or of ivory, of which the principal are the flute, piccolo, clarinet, flageolet, basset-horn, oboe, and bassoon. They are generally characterized by a soft, smooth, aerial tone, resembling the human voice. By the use of holes and keys, considerable compass is given to them; they are capable of producing only one sound at a time, but with considerable command of piano and forte. Of brass instruments the chief are the horn, trumpet, trombone, cornet-a-piston, euphonium, bombardon, and ophicleide. They are generally more powerful, and their quality more piercing than wood instruments; the ophicleide, however, approaching more than the rest to wood instruments in capabilities and tone. In a full orchestra there are generally two flutes, two oboes, two clarinets, two or four horns, and two bassoons, frequently with the addition of two basset-horns, one or two piccolos, and one or two ophicleides or trombones. Each part, except when there is an unusually large number of bow-instruments, is single.

The organ is a combination of a large number of wind-instruments, sounded, not by the breath, but by the admission of air into the wind-chest, by means of keys pressed down by the performer.

WINDLASS is that modification of the wheel and axle which is employed in raising weights, such as bucketsful of water from a well, coals from a pit, etc. Its simplest form is that of an axle supported by pivots on two strong upright pieces, and pierced near one end with four or six square holes, into which handles, known as *handspikes*, are inserted. In other forms, a winch at each end is substituted for the handspikes. If the weight (say a bucket of water) is to be lifted a considerable distance, the length of the rope which attaches it to the axle largely increases the weight, and thus aids the power when descending, and counteracts it when ascending. This difficulty is partially got over by employing a double rope with two buckets, one of which ascends while the other descends; but this modification, though partially effective for the end in view, lends aid to the power when aid is least, and hinders it when aid is most, required. A more efficacious plan is to form the axle not cylindrical, but of a barrel-shape, like two truncated cones placed base to base, and to fasten two ropes, one to each end, so that when coiled up round the barrel they approach the middle; in this case, when one rope is fully uncoiled, and winding-up commences, the gross weight, which is then at its maximum, acts at the minimum leverage of the end, and as the progress in winding up diminishes the weight, its leverage so increases that the momentum is preserved uniform. On the other hand, the empty bucket, when commencing its descent, acts at its greatest leverage, and as the unwinding of the rope adds to the weight, its leverage becomes smaller, so that the momentum of the descending weight always remains the same; and thus the strain on the power is preserved uniform. The ratio of the weight to the power it is sometimes found necessary to increase greatly; but with the ordinary windlass this could only be effected by similarly increasing the ratio between the leverage of the handle and the radius of the axle—an object attained by a great increase of the former, rendering the machine too cumbersome, or by greatly diminishing the latter, and so weakening it. The desired result is attained, however, in a manner not liable to these objections, by the use of the *differential axle*, an axle of which one-half is of greater diameter than the other, and the single rope, after being coiled round the whole axle from end to end, is fastened at each end of the axle, and the weight is hung by a pulley, which is supported in a bulge in the center of the rope. As the portion of the rope on one-half of the axle is unwound, that on the other half is wound up; but since the rates of winding and unwinding are different, the bulge of the rope increases when the rope is wound on the smaller end of the axle, and decreases when it is wound off the smaller end. The more nearly equal the two radii of the axle are, the greater is the weight which can be raised by the power—the ratio between the two being

$$\frac{W}{P} = \frac{\text{radius of circle described by power}}{\text{difference of radii of the portions of the axle}};$$

so that if the radius of the power is 18 in., and the radii of the axle 5 and 4 in., the power balances a weight = 18 times itself; while the strength of the axle requires

wind acting on one face of them preserves their perpendicularity to it, and secures a maximum effect, but when, after a further semi-revolution, the other side is presented to the wind, they are raised to a horizontal position. Most of the recent improvements in windmills have had for their object the regulation of the sail-area exposed to the wind to counterbalance the variations in the latter's force, and so produce uniformity of motion; but these are too numerous to be here noticed. We may mention, however, that the inventions, with this object, of Mr. Bywater in England, M. Berton in France, and Mr. Henry Glover of Massachusetts, are both ingenious and effective. Windmills were introduced into Europe from the Saracens, and were formerly much more extensively used in England than now. They are, however, still common in the midland and southern districts; on the continent, especially in Holland and France; and in the United States.

WINDOM, WILLIAM, b. Ohio, 1827; studied law, and was called to the bar. After practicing for several years in his native state, he went to Minnesota in 1855; was a member of congress from that state, 1858-68; and in 1870 became a U. S. senator by appointment to fill a vacancy. He was elected for a full term in 1871; re-elected in 1876, and resigned in 1881 to become secretary of the treasury in president Garfield's cabinet. In this department he has already, within the first two months, shown high ability and achieved signal success.

WINDOW (connected with *wind*, as Lat. *fenestra* with *ventus*) is an opening in the wall of a building for the admission of light and air. In the east, from time immemorial, windows open, not upon the street, but upon the court, and are usually provided with lattices or jalousies. The Chinese use, instead of window-glass, a thin stuff varnished with shining lac, polished oyster-shells, and thin plates of horn. Among the Romans windows were originally closed with shutters; afterward they were made of a transparent stone, *lapis specularis*, which, from the description, can be nothing else than mica; and, in the 2d c. after Christ, of horn. According to some there are traces of glass windows having been used in Pompeii; but the matter is doubtful. The first indisputable mention of glass windows is made by Gregory of Tours in the 4th c. of our era, who speaks of church windows of colored glass. Wilfrid (q.v.), on succeeding to the archbishopric of York in 669, filled the vacant windows of the cathedral with glass. In 674 abbot Benedict Biscop brought artists from France to glaze the windows of the abbey of Weremouth; and the bishop of Worcester did the same in 726. Leo III., in the end of the 8th c., put glass windows into the church of the Lateran. Glass began to be used in windows of private houses in England as early as 1180; in France in the 14th century. As late as 1458 it struck Æneas Sylvius very much that in Vienna most of the windows were glazed. See GLASS.

In ancient temple architecture, windows were unknown—the light being obtained from openings in the roof. In Gothic architecture, however, the window is one of the most important features, giving, by the infinite variety of its outline, and the graceful forms of its tracery, as much character and beauty to the Gothic edifices as the styles and colonnades of ancient art gave to the classic temples.

In the early Gothic or Norman style, the windows were small and comparatively stunted—they were either simple openings with semicircular head, or two such grouped together with a larger arch over both, and with the usual moldings and ornaments of the style. The inside had generally a deep splay, and simple molding on the outside. Small circular windows sometimes occur in Norman work.

In the early English style the windows were more elongated, and had pointed arches. They are frequently grouped in twos or threes, and placed so close that the wall between becomes a mullion. The wall over the group contained within the inclosing arch then becomes perforated with a quatrefoil or other ornamental opening, and thus the simpler forms of tracery become introduced. The interior arches are splayed off, and are frequently very elaborately decorated with shafts and arch moldings. The lancet window (so called from its shape) is common in this style. Circular windows are also used with tracery formed by little radiating shafts with small arches. The triangular window, on a small scale, is also occasionally to be met with.

It is in the decorated style that the windows become enlarged and filled with mullions and tracery. This is at first simple, and composed of geometric figures such as the origin and progress of tracery (q.v.) naturally led to. As the style advanced, more flowing forms were introduced, until, in the 15th c., the tracery passed into the perpendicular style (q.v.) in England, and into the flamboyant (q.v.) in France. The heads of the lights, and the apertures in the tracery, are usually foiled, and the inner jambs are splayed and ornamented with moldings, shafts, etc. In elaborately traciced windows, the jamb and arch moldings are occasionally very small, but they are usually bold and deep.

In the later Tudor style the window-heads became flattened into the four-center arch; and in the time of Elizabeth and James I. the arch gave place altogether to the flat lintel with the opening divided by mullions into rectangular lights, sometimes foiled at top. Circular windows, with elaborate tracery, are chiefly found in the decorated period.

In domestic buildings the windows are similar to the above, but square-headed win-

dows occur more frequently to suit the height of the floors; and the space between the sill and the floor is recessed and fitted with seats. Transoms are also of common occurrence. The bow or bay window (q.v.) is also a frequent and very elegant feature in the later Gothic buildings.

In the revived classic styles the windows are almost invariably plain rectangular openings, with either a flat lintel or semicircular arch-head. They have sometimes architraves round the jambs and lintel, or are ornamented with pillars supporting an entablature or pediment above. The architraves are frequently carved, and the cornices carried on trusses at each side.

The style of shop-fronts has been much modified, and the windows enlarged, in consequence of the facilities afforded by the use of plate-glass.

WINDPIPE. See *TRACHEA*, *ante*.

WINDSOR, a co. in e. Vermont, bordering on New Hampshire, having the Connecticut river for its e. boundary, drained by the White, Black, and Quechee rivers; 900 sq.m.; pop. '80, 35,192—32,309 of American birth, 95 colored. It contains Ascutney mountain in the s.e., rising 3,300 ft. above the level of the sea. Among its mineral products are marble and syenite. Co. seat, Woodstock.

WINDSOR, a t. in Hartford co., Conn.; $6\frac{1}{2}$ m. n. of Hartford on the New Haven, Hartford, and Springfield railroad; on the w. bank of the Connecticut river, near the mouth of the Farmington; pop. '80, 3,056. There are large manufactures of paper, cigars, bricks and woolen goods. Water power is supplied by a canal around the rapids in the river.

WINDSOR, properly called **NEW WINDSOR**, a municipal and parliamentary borough of Berkshire, beautifully situated on the right bank of the Thames, 23 m. w.s.w. of London. Windsor and Eton in reality form one town. The town is chiefly interesting on account of its being the scene of *The Merry Wives of Windsor*, and the antiquity of its castle and parks, which have been a favorite residence of English monarchs, especially since the time of William the conqueror. The elevated plateau of natural chalk upon which it stands marked it out, no doubt, as a naturally strong place from the earliest dates, but the deficiency of water which such a position entailed was a serious objection to its being adopted as a permanent residence for many years. The older palace of the English kings was at *Old Windsor* about 2 m. distant, and considerable doubt seems to exist among antiquaries and historians as to the first English king who built solid work of masonry at Windsor castle. In the time of Edward the confessor it was probably a wooden structure, as stone was difficult to be had, and wood was abundant. William the conqueror probably built the first substantial stone buildings, and regularly fortified the place; but the absence of water, except what was carried to it from the Thames, must have for a long time been a serious drawback to its importance as a military station. The history of the existing fabric begins in the reign of Henry III. The buildings may be said to be grouped in three portions—the middle ward containing the round tower; the lower ward on the w., containing St. George's chapel, the houses of the military knights, cloisters, etc.; and the upper ward on the e., containing the sovereign's private apartments. The unfinished chapel which was begun by Henry III., was completed by Edward III., rebuilt by Henry VII., and added to by cardinal Wolsey. Under this chapel is the burial vault of the present royal family. The round tower, formerly believed to be Norman, but in which there is not a single yard of Norman masonry, was built in the 18th year of Edward III. to receive the round table of the knights of the newly-founded order of the garter. Pop. (1871) 11,769. The park and forest immediately adjoining are 13,000 acres in extent, and contain many historic trees, such as Elizabeth's oak; Shakespeare's oak; the long walk, made in the reign of Charles II. and queen Anne's ride of elms, 3 m. long. Herne's oak, rendered so famous by Shakespeare, was blown down in Sept., 1863, and a stone and young tree now mark the spot. The oldest planted timber in England, viz., that of the reign of Elizabeth, is also in Windsor park, and there are many oaks of which it is well established the age must be 1000 years.—See Tighe's *Annals of Windsor*; Menzie's *History of Windsor Forest*; Hepworth Dixon's *Royal Windsor*.

WINDSOR, a t. the co. seat of Hants co., Nova Scotia, on the Windsor and Annapolis railroad; pop. '71, 2,715. It has churches, schools, a bank, and a newspaper. It has iron-foundries, ship-yards, etc. King's college, the most important in Nova Scotia, is here.

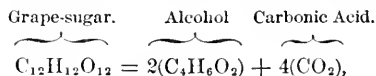
WINDSOR, a t. in Essex co., Ontario, on the Detroit river, and the Great Western railroad, opposite Detroit; pop. '71, 4,253. It has churches, banks, schools, and newspapers. Among its manufactures are tobacco, boots and shoes, beer and liquors, carriages, etc.

WINDWARD ISLANDS. See *ANTILLES*.

WINE, CHEMISTRY AND MANUFACTURE OF. Before entering into the chemistry of this subject, it is necessary that the composition of the grape, from whose juice it is derived, should be understood; and as there is an immense variety of vines yielding grapes

of corresponding variety, and as the same variety* will, under different external influences, produce very different grapes, it is obvious that our researches must be confined to the most typical form of grapes. The principal component of the juice of ripe grapes is water, in which are various substances, either held in solution or very minutely divided. The juice as obtained by pressure, is thick, and exposure to the heat of the sun rapidly changes it into a fermented liquid. As principal components held in solution in the water, professor Mulder mentions "sugar (both grape-sugar and fruit-sugar), gelatine or pectine: gum, fat, wax, vegetable albumen, vegetable gluten, and some other substances of the nature of extractive matters, which are not, however, accurately determined; tartaric acid, both free and combined with potash (as cream of tartar), partly also combined with lime: in some cases, we find also racemic acid, malic acid, partly quite free, partly combined with lime, and, according to some, tartrate of potash and alumina; further, oxide of manganese and oxide of iron, sulphate of potash, common salt, phosphate of lime, magnesia, and silicic acid may also exist."—*Chemistry of Wine*, p. 5. Although no other ingredients have as yet been discovered in grape-juice, others, which only appear during fermentation, and impart not only the vinous smell common to all wines, but the aroma (bouquet) and the flavor peculiar to each wine, must exist in it in small quantities. In those cases where the skins are allowed, as in the preparation of red wine, to ferment with the juice, the constituents imparting odor and flavor may be drawn from them. Coloring matter and tannic acid are undoubtedly found in the skin, and are thus imparted to red wines. Moreover, the grape-stones, which are left with the skins, yield tannic acid freely during fermentation. The different proportions in which the inorganic matters—the potash, soda, lime, magnesia, iron, manganese, sulphuric acid, phosphoric acid, and chlorine—exist in grape-juice, exert a very great influence upon the quality of the wine, both in relation to its color and its taste. A relative excess of phosphoric acid, or of lime, or of soda, will induce changes sufficiently obvious to the chemist, but which we have not space to discuss. With regard to the acids of grape-juice, or *must*, as it is technically called, professor Mulder observes that, as a general rule, the three—viz., tartaric, malic, and citric—are rarely found together in one fruit, and he doubts whether the presence of citric acid has been fully proved. Malic acid exists in unripe, and tartaric acid in ripe grapes; and while no malic acid exists in wine made from perfectly ripe grapes, a small quantity is present in most wines. In the article TARTARIC ACID, it is shown that a nearly allied acid *racemic acid*, exists in exceptional cases in grapes. The quality of wine is only affected if this acid be largely present, because less lime than usual will be found in it, racemate of lime being less soluble than tartrate of lime, and further, because cream of tartar is more soluble than biracemate of potash. Such wines are consequently sweeter, and—if red wines—darker colored, than wines containing only tartaric acid. The quantity of sugar varies extremely. In the juice of very ripe grapes, it may reach 46 per cent. According to Fontenelle, the juice produced in the s. of France contains from 30 to 18 per cent, while in the neighborhood of Stuttgart, Reuss determines it at from 25 to 13 per cent. In the low and variable temperature of Holland, the juice of the best grapes yields only 10 or 12 per cent of sugar. The composition of the albuminous matter is not clearly determined. In an analysis of the must of the Riesling grapes of Grumbach, Beltz found that the gluten (no albumen was found) was thirty times less abundant than the sugar. It probably varies at from 1 to $\frac{1}{2}$ per cent. The only other ingredient requiring notice is fat, which is chiefly but not entirely derived from the grape-stones, in which it is an abundant ingredient. It occurs in wine, in minute quantity, in the form of a fatty acid.

On the subject of the fermentation of the grape-juice we shall only offer a few remarks. It has been already stated that the saccharine contents of grape-juice range from 13 to 30 per cent. If we regard all this sugar as grape-sugar, $C_{12}H_{22}O_{12}$, with an equivalent of 180, then each atom may be resolved into 2 atoms of alcohol, $C_4H_6O_2$, with an equivalent of 46, and 4 of carbonic acid gas, CO_2 , with an equivalent of 22, according to the equation—



provided that there is no loss; or under the most favorable conditions of fermentation, 180 parts (by weight) of anhydrous grape-sugar, or 198 of the hydrated sugar (with the formula, $C_{12}H_{24}O_{14}$), may yield 92 parts of alcohol; or, roughly speaking, 2 parts of sugar yield 1 of alcohol. "According to this," says Mulder, the juice of French and German grapes gives, when analyzed, as a maximum, from 7 to 15 per cent of alcohol by weight. But some of the sugar remains undissolved, and, during fermentation, more alcohol is evaporated than water; therefore, for such grape-juice, or rather for the wine to be produced from it, the alcoholic contents must be under 15 per cent as a maximum, and 7 per cent as minimum."—*Op. cit.*, pp. 49, 50. According to Mulder, sugar is found

* A certain variety of grape, when grown upon the Rhine, furnishes a species of Hock; the same grape when raised in the valley of the Tagus, yields Bucellas; while in the island of Madeira it produces the wine known as Sercial, which has a flavor quite different from either of the others. See Miller's *Organic Chemistry*, 3d ed. p. 187.

in all wine,* and its quantity depends to a considerable extent upon the treatment to which the grapes are subjected before pressure. Tokay wine, for example, is prepared from grapes which have been allowed not only to get over-ripe, but partly to dry on the vines; *vin de paille* is obtained from grapes dried on straw exposed to the sun; and in both these cases, water is evaporated, and the concentrated juice yields a wine of extra strength. The strong heavy wines used by the ancients were thus prepared. When the grapes are dried on the vine, the wine is called *vin sec*; and when the juice has been evaporated by the aid of heat, the wine is called *vin cotti*.

In consequence of the close connection which exists between the amount of sugar in the grape-juice and the excellence of the wine which it yields, attempts are often made, especially in bad seasons (want of heat and light, and excess of rain), to introduce extraneous sugar into the juice; or, as it is technically called to *doctor* it. For this purpose, a cheap fermentable sugar is added to the sour juice, an adulteration which cannot subsequently be detected by chemistry, although it may be suspected, from the absence of the proper aroma from the wine. Similarly, sugar is often added to good grape-juice, in order to obtain a stronger wine than the natural product. Many imitations of port wine are thus manufactured. The character of the wine is much influenced by the extent to which the process of fermentation is allowed to proceed. If it goes on till all the sugar is converted into alcohol, a *dry* wine is produced; when it is checked before the change is completed, a rich *fruity* wine is produced; and when the wine is bottled while the fermentation is still in progress, effervescent wine is formed.

Shortly after the must has passed from the wine-press symptoms of fermentation appear; the juice becomes more turbid, bubbles rise to the surface, and a froth soon settles there. This process in a moderate climate usually reaches its highest point in three or four days; and before it is quite finished the whole liquid mass is stirred up so as to re-excite the process. For this purpose, in many districts a naked man used (we do not know if the custom generally still exists) to go into the wine-tub, who both accomplished the necessary stirring and promoted fermentation by his animal heat. Several persons have been killed in this way by suffocation from the atmosphere of carbonic acid gas. In two or three weeks the fluid becomes comparatively clear, and a precipitate forms at the bottom. The wine is now removed from the sediment into another vessel, and a slow form of fermentation—*after-fermentation*, as it is termed—goes on for several months, sugar being constantly converted into alcohol and carbonic acid, and a fresh precipitate forming at the bottom. Several similar changes into other vessels are made, to get rid of the sediment, till it is fit for transferring into casks. That the process of fermentation may go on satisfactorily, not only must water, sugar, and a nitrogenous matter in a state of actual change be present, but there must be a certain temperature and a certain amount of atmospheric air present. "Although," says Mulder, "there is a wide interval between the extremes of temperature at which fermentation is possible, the boundary is very narrow which limits good and active fermentation in every kind of wine. The grapes of each country ripened under different degrees of summer warmth and very unequally rich in constituents, require very different temperatures during fermentation; and different temperatures are also required for grapes which are the product of a warmer or a colder summer. But on these points we have little accurate knowledge. All we know is that a high temperature during autumn promotes fermentation, and a low one is detrimental to it; and that inequality of temperature during fermentation is extremely injurious, and not unfrequently spoils the wine altogether."—*Op. cit.* p. 61. To what extent it is expedient to admit atmospheric air to the must, so that the fermentation may go on most favorably, is a point regarding which there has been much discussion, and which is not definitely settled. While some have asserted that no air is necessary to the development of fermentation, others have maintained that the wine is improved by the free admission of air during fermentation. Gay-Lussac proved experimentally that air is essential to initiate fermentation, which would then be continued without any fresh supply; and for many years wine was made in France with an almost total exclusion of air from the fluid by an arrangement intended to prevent the escape of alcohol by evaporation; but when the same chemist proved that by the use of open vats scarcely $\frac{2}{100}$ part of the alcohol was lost, this arrangement fell into disuse. Judging from the method of preparing Bavarian beer, in which air is allowed to enter freely, Liebig recommended the same in the case of wine, and suggested that a large opening should be made in the casks in which fermentation takes place. This method has been tried on a large scale by Von Babo, Crasso, and others, with red wine, which was found to be of a better quality than that which underwent the same process in a cask which was closed, and only provided with a glass tube for the escape of the carbonic acid. But in other experiments made with white wine, the wine in open casks appeared to lose in aroma; and hence the solution of this question apparently depends on the kind of wine. Liebig's opinion has been very fiercely, and, as Mulder thinks, unfairly attacked; the probability is that wines containing much sugar may be allowed

* Dr. Bence Jones, in the appendix to his translation of Mulder's work, declares, on the other hand, that while port, sherry (except in two instances), Madeira, and champagne, always contain sugar; claret, Burgundy, Rhine, and Moselle wine (excepting one sample of sauternes) are always free from every kind of sugar.

with advantage to ferment in closed vessels, while those less rich in that substance may be left in open casks, provided the temperature be low and equable. When the main object is to increase the quantity of alcohol, the admission of much air is injurious, since it promotes the formation of acetic acid, and causes a corresponding loss of alcohol.

The actual substance—*ferment*—which causes the breaking up of sugar into alcohol and carbonic acid, has been submitted to careful chemical and microscopical examination. One hundred parts of sugar require about 1.5 parts of ferment reckoned in the dry state; and as the analysis of ferment shows that about half of it consists of albuminous matter, it follows that $\frac{3}{4}$ of a part of albuminous matter are required for the conversion of 100 parts of sugar into alcohol and carbonic acid. Ferment consists of cells or globules of *torula* (q.v.), which are precisely the same in the production of wine and beer. It is the contents of these cells which contain the active albuminous matter; while the cell-wall, consisting of cellulose, $C_{12}H_{10}O_{10}$, and produced from gum or vegetable mucus, is inert.

The leading points in which the constituents of grape-juice and those of wine differ from one another in consequence of fermentation are, that in the wine there is a diminution (1) of the mucilaginous and saccharine matters, in consequence of the formation of ferment and alcohol; (2) of those substances which are insoluble in common water, but are held in solution in the viscid must, as, for example, phosphate and sulphate of lime; and (3) of cream of tartar, tartrate of magnesia, and sulphate of potash, which, being less soluble in spirit than in water, fall as the formation of alcohol increases. Red wines lose a portion of coloring matter and of the tannin, which is withdrawn by these salts, and hence become of a lighter color and less astringent. Before noticing the alcoholic strength of different wines we shall briefly describe the concluding steps necessary for rendering wine fit for use. The process of *clearing* is undertaken with the view of removing all the sediment in which albuminous matters may still occur, and of diminishing the coloring matter and tannin of red wines. Among the substances used for these purposes may be mentioned albumen, isinglass, gum, milk, lime, gypsum, etc. In warm countries gum is preferable to albumen or isinglass. The addition of lime throws down a precipitate of salts of lime, which carries down, in the case of red wine, a considerable quantity of coloring matter; its addition gives a sweeter and less astringent taste to the wine, and an appearance of age. As a general rule clearing increases the durability of wine. *Sulphurizing* is a process which is especially applied to sweet white wines which possess an excess of sugar and albuminous matter, and little tannic acid, and thus become easily decomposed. Its object is to check undue fermentation, and to prevent the formation of mold, which afterward imparts a musty taste to the wine. The process is effected by burning sulphur in bottles or casks, and instantly pouring in the wine, which absorbs the sulphurous acid. Wine intended for exportation to warm climates is usually strongly sulphurized. Of course great care must be taken that the sulphur is free from its common impurity, arsenic. In place of sulphurizing, another method of hindering the fermentation of sweet wine is adopted in some parts of France; it consists in putting $\frac{1}{1000}$ part of powdered mustard into the wine; but how it acts is unknown.

Having traced the chemical history of wine from its original state of grape-juice to the time when, having been clarified, and poured into casks and bottles, it is fit for use, we ought, in order to complete the sketch, to notice the subsequent changes which, in the course of time, it undergoes in the cellar. The ages at which different wines attain their perfection are, as is well known, extremely different. "As a general rule," says Mulder, "wines which have retained a considerable portion of albuminous matter, and possess but little tannic acid, cannot resist the influence of time; they become acid, or undergo some other change. This occurs in the case of Rhine wines, which contain but little alcohol; and all those wines which contain much sugar, or but little tannic acid, cannot be kept long. Wines which can be *cellared* are those which improve; or, to speak more correctly, those wines are stored which improve with age. In these odoriferous substances are formed, and the wine becomes less acid and better tasted. Such wine as is colored often deposits a considerable amount of sediment; and if it be stored in casks there is a constant increase of alcohol."—*Op. cit.*, pp. 105, 106. Wine is improved by being kept in wooden casks, as water escapes by evaporation, and the other constituents are relatively increased. The vinous constituents being thus concentrated exert a stronger chemical action upon each other, and render the wine not only stronger, but better flavored. The change, however, does not stop here. The loss of water must be replaced by the addition of wine, otherwise the action of the air would turn the wine sour, and convert the alcohol into acetic acid; and the diminution of water, which is thus replaced by wine, causes a constant increase of tartaric acid. Wines which are poor in sugar may thus soon become too sour; and consequently all wines cannot undergo this process. The popular idea that wine which has grown old in bottles has therefore become richer in alcohol is altogether false, and is doubtless founded on the fact that it is only the strongest wines that can be preserved. The color, however, of bottled wine is materially affected by age: liqueur-wines and red wines containing no large amount of tannic acid becoming darker, while wines which are rich in tannic acid, as port, for example, deposit a sediment, and become lighter. Old bottled wines contain odoriferous constituents—ethers of various organic acids—which are

not found in new wine. For an explanation of the mode of formation of these compounds, to which wine owes its *aroma*, we must refer to the chapter on "The Odoriferous Constituents of Wine" in Mulder's work; we will here merely remark that diminution of the free acids is necessarily associated with the formation of these compounds, and that this diminution can only occur by the acids being either decomposed or combined with non-acid substances, both of which operations here take place as the result of a very slow chemical process. This effect of time may, however, be imitated by art; and if bottles corked, but not quite filled with wine, are placed for two hours in warm water at a temperature of 185°, and after cooling are filled, their contents possess the flavor and aroma of wine that has been bottled several years. This result was originally obtained by Appert; but Pasteur and others have, during the last few years, again brought the subject before the French academy. Wines which have been long in bottle sometimes acquire a peculiar flavor, which is incorrectly referred to the cork. It is in reality due to the peculiar mold which grows from the outside of the cork inward; and should it reach the inner surface, it imparts to the contents of the bottle a peculiar taste; and this wine is said to be *corked*. Very similar to this is what is known as "the taste of the cask," a peculiar flavor sometimes acquired by wine before bottling. This flavor is regarded as dependent on the development of a peculiar essential oil during the growth of "mold" on the surface of the wine. It can be removed by the addition to each pipe of about a quart of olive oil, which dissolves the unpleasant flavoring matter, and carries it to the surface.

In submitting matured wines to chemical analysis it is found that they differ materially from one another in their composition; and especially as the wine is, or is not, red. In white wine no special coloring matters are found, and only a trace of tannic acid; while in red wine both are present. In wine generally the principal ingredients are alcohol and water; then sugar, gum, extractive and albuminous matters; then free organic acids, such as tartaric, racemic, malic, and acetic acid; and salts, such as the tartrates of potash, of lime, and of magnesia, sulphate of potash, chloride of sodium, and traces of phosphate of lime; also, especially in old wines, substances imparting aroma, as *cinanthic* and acetic ethers, and other volatile odoriferous matters (among which Mulder mentions butyric and caprylic ethers, each having a pineapple odor, caproic, pelargonic, capric, and propionic ethers, amylic alcohol, and many of its ethers and other compounds, aldehyde, acetal, and probably racemic, citric, and malic ethers). In red wines, and in many others, a little iron, and possibly some alumina, may be found; and lastly, the best wines contain, according to Fauré, a peculiar matter, which he terms *emathin*, and to which he ascribes the substance or body of the wine; but which seems to other chemists scarcely to differ from gum or dextrine. These ingredients, as Mulder observes, vary exceedingly in proportion. The quantity of some is so small that the substance almost disappears during analysis; others can just be determined by a delicate balance; while others, again, are freely present. Putting aside taste and smell as standards of comparison, most of the essential dietetic and therapeutic properties of wine depend upon the *alcohol*, *sugar*, and *free acids*, especially *tartaric acid*, contained in it. In his chapter on "The Amount of Alcohol in Wine," Mulder gives a large number of analyses of different wines in which the percentage of alcohol is determined. We shall here only give the abstract of the analyses made by his translator, Dr. Bence Jones, who found that the alcohol varies in

		Per cent.	Per cent.
Port.....	from	20.7	to 23.2
Madeira.....	"	19.0	" 19.7
Sherry.....	"	15.4	" 24.7
Champagne.....	"	14.1	" 14.8
Burgundy.....	"	10.1	" 13.2
Rhine wine.....	"	9.5	" 13.0
Claret.....	"	9.1	" 11.1
Moselle.....	"	8.7	" 9.4
while in			
Brandy.....	there was	50.4	to 53.8
Rum.....	"	72.0	" 77.1
Geneva.....	"	49.4	"
Bitter ale.....	"	6.6	" 12.3
Porter.....	"	6.5	" 7.9
Cider.....	"	5.4	" 7.5

Sugar is found in all wines,* although in certain kinds very little exists. According to Fresenius the sugar in four kinds of Rhine wine amounts to exactly six-sevenths of the extract remaining after evaporation, the seventh part consisting of the salts and non-volatile unfermentable matter. In red Bordeaux, on the other hand, very little sugar is found; red sauterne contains less than 1 per cent of extract, and hermitage 1.7;

* In the preceding foot-note we have mentioned that Dr. Bence Jones denies the accuracy of this statement.

hence the quantity of sugar must be very minute; while some kinds of muscat yield 24.5 of an extract, containing about 22 per cent of sugar. Small as is the quantity of sugar in some wines, it is of great importance in diminishing the sharp taste of the free acids, and in imparting an agreeable flavor to the wine. Good red wines should contain at least one-half per cent of sugar, and the quantity is sometimes larger. Some of the sweet wines contain nearly one-fourth of their weight of saccharine matter.

The following results were yielded by the experiments of Dr. Bence Jones:

Sherry (18 samples)	sugar in 1 oz. varied from 4 to 18 grains.
Madeira (9 samples)	" " 6 to 20 "
Champagne (4 samples).....	" " 6 to 28 "
Port (8 samples)	" " 16 to 34 "
Malmsey Madeira	" " 56 to 66 "
Tokay	" " 74 "
Cyprus	" " 102 "

Under the term "free acids" are included the acid tartrate of potash, known as cream of tartar, and other soluble bitartrates found in wine, besides such acids as are quite uncombined, such as tartaric, malic, and acetic acid, and a trace of free tannic acid. Sugar has so much power in concealing the free acids, that their amount cannot be estimated with any certainty by the flavour of the wine, and must be estimated chemically by ascertaining how much of an alkaline solution of given strength must be used in order to render a given quantity of wine perfectly neutral to test-paper. Volatile acids, as, for example, acetic acid, may either be determined separately, or included with the others; and, excepting this acid, all the other acids occurring in wine may practically be calculated as tartaric acid. Mulder found that acetic acid was present in 20 different kinds of wine which he examined, the amount of the anhydrous acid ranging from 1.75 thousandth parts in Madeira to 0.25 thousandth parts in Tavella. In the same 20 kinds of wines, the free tartaric acid ranged from 2 to 7 parts in 1000 of wine, Tavella having the largest, and Bordeaux sauterne the smallest quantity. With regard to the tannic acid, traces of it may be found in all white wines, but in no white wine is it sufficiently abundant to be of the slightest importance in a medical or dietetic point of view. On the other hand, it is abundant in Port and heavily loaded Bordeaux wines, especially when new. In the course of time, this tannic acid becomes oxidized into a sparingly soluble compound, which is called by Berzelius the *apothemat*, or precipitate of tannic acid—a process which is facilitated by the exposure of the wine in bottles to full daylight. There is no doubt that this acid, by combining with the albuminous matters, tends to increase the durability of these wines. Dr. Bence Jones, in his Appendix to Mulder's treatise, gives numerous results of experiments made regarding the acidity of wines by Prout, Liebig, Fresenius, and himself. His general conclusions are that, "proceeding from the least acid wine to the most acid, we have sherry, port, champagne, claret, Madeira, Burgundy, Rhine wine, Moselle. The least acid fluids examined were Geneva and whisky; then rum, brandy, ale, porter, stout. The wines were all more acid than the malt liquors." Mr. Griffin has made 22 determinations of the acidity of light wines for Dr. Druitt, which are published at the end of that physician's instructive little work on *Cheap Wines*, and has subsequently published an independent volume on the mode of determining the acidity of wines.

In conclusion, we may say a word or two on "the diseases of wine," by which term we understand those conditions in which the wine has become so altered and unfitted for use as to have lost its distinct character. The most important of these diseases are:

1. *The turning of wine*.—This disease is incidental to young wine, and seems to occur under special conditions of the weather. The color becomes darker, and the taste first disappears, and, if the disease goes on, becomes disagreeable; the wine becomes turbid and acid. This disease is caused by a decomposition of tartar.

2. *The ropiness of wine*.—This disease consists in the formation of vegetable mucus from the sugar of the wine, and is known as mucous fermentation. The wines liable to this change are those which are deficient in tannic acid.

3. *The bitterness of wine*—to which Burgundy wines are especially exposed—seems due to a second fermentation, inasmuch as a large amount of carbonic acid is evolved. It has been ascribed, whether correctly or not we cannot say, to the formation of citric ether, which is very bitter. The disease is caused by the sediment, and often ceases on being drawn off into other casks.

4. *The acidifying of the wine* depends upon the conversion of the alcohol into acetic acid, and may be stopped at its commencement by adding alkaline carbonates, which, however, destroy the colour, and affect the taste of the wine.

5. *The moldiness of wine* is a disease in which mold plants are produced on the surface of the wine. How or under what conditions the mold is formed, is not known, except that the admission of air is favorable to the disease.

For further information on this subject, we may refer, *inter alia*, to Henderson's *History of Ancient and Modern Wines*, Bence Jones's translation of Mulder's *Chemistry of Wine*, and to the recent works of Shaw and Denman, in English; to those of Julien, Chaptal, Fauré (1844), and Batilliat, in French; and to those of Ritter, Balling, Von

Babo, Bronner, etc., in German; also to the chief works on technological chemistry in all languages.

Manufacture.—The mode of manufacturing wine varies in its details in different countries. Pagnierre, in his treatise *On the Wines of Bordeaux*, gives the following description of the manufacture of the superior clarets. The grapes, after being gathered, are picked; all that are likely to injure the quality of the wine being carefully removed. A principal vat of the best fruit, which is called the mother-cask (*cuve-mère*), is then made, into which, after picking, the workmen continue to put the best grapes, without their stalks, and without treading them, till they are from 15 to 20 in. deep; after which they throw about two gallons of old cognac or armagnac upon them, and then another bed of picked grapes, followed by two gallons more of brandy, and so on till the vat is full. Spirit of wine is then added, about four gallons being used for a wine-vat of from 30 to 36 tons. The amount of brandy and spirits that is added varies with the quality of the vintage, the better vintages requiring the less spirit. When there is a deficiency of saccharine matter in the grapes, starch-sugar is sometimes added. The *cuve-mère*, when filled, is closed and well covered with blankets to prevent the entrance of air, and is left in this state for about a month. A small cock or tap is placed in the side of the vat at about a third of its depth from the bottom, in order to allow of the progress of fermentation being observed; and to enable the manufacturer to know when the wine, having become cool and sufficiently clear, may be racked off and put into casks, previously prepared by scalding and rinsing with a little spirit. While the *cuve-mère* is at work, the ordinary vintage goes on as follows: The grapes are trodden or acted on by machinery in the press, and put with their stalks into the vats, when the fermentation takes place naturally. About a foot of the upper part of the vat is not filled, in order to leave space for the fermentation, which in very mature vintages sometimes occasions an overflow of these limits. The term *chapeau* is applied to the floating mass of stalks, seeds, and skins on the surface. The vats are lightly covered, and in from a week to a fortnight the wine is ready for being drawn off; for if it is left upon the lees (*marre*), or in contact with its crust (*chapeau*), it would take the disagreeable taste of the stalks. The barrels in which it is then placed are filled to about two-thirds or three-fourths, after which the *cuve-mère* is emptied, and its wine is poured in equal portions into these casks so as to fill them; and the remainder is used to replace every week what is lost by evaporation, or may have leaked away. All proprietors have not the means of making a *cuve-mère*; but in its absence, and with the employment of small vessels, wine of an inferior character is produced. The casks being full, are left unbunged for about a week, the bung-hole being in the meantime covered with a brick or piece of wood. They are filled up every two days, and after bunging, at least once a week, till the wine is in a state to allow the cask to rest with the bung-hole at the side, which is not till after a year and a half.

White wines are made in a somewhat different manner. The grapes are not, as in making red wine, put into the vat to ferment, but after the removal of the stalks, they are trodden, and when taken from the press, the juice, skins, and seeds are put into casks, in which the fermentation takes place, and wine is formed. When the fermentation has ceased, the wine is racked off from the barrels into smaller casks; and any loss that subsequently occurs from evaporation must be replaced once or twice a week.

The nature of the wine-press possesses many modifications. The wine-presses of the Jews consisted of two receptacles, or vats, placed at different elevations, in the upper one of which the grapes were trodden, while the lower one received the expressed juice or must (see Joel iii. 13). These vats were usually hewn out of the solid rock (Isa. v. 2 (margin), and Matt. xxi. 33). In Wilkinson's *Ancient Egyptians*, vol. i. p. 46, there is a figure of a wine-press thus composed of two vats or receptacles. In the process of treading, which seems to have prevailed from the earliest ages, the treaders were assisted by ropes fixed to the roof of the press. A certain amount of juice was allowed to exude from the ripe fruit by its own pressure before the treading began. This was kept separate from the rest of the juice, and formed the *gleucos*, or "sweet wine" noticed in Acts ii. 13. The first drops that reached the lower vat were called the *dema*, or tear, and formed the first-fruits of the vintage, which were to be presented to Jehovah (Ex. xxii. 29). Although the ancient system of treading the grapes still prevails in many countries, it is being gradually displaced by various mechanical appliances. In some parts of France, two wooden cylinders turning in opposite directions are employed to crush the fruit; and the reader will find accounts of more complicated presses in the various works on wine by Cyrus Redding and later authors.

Commerce.—The manufacture of wine has been carried on in all countries where the grape could be successfully cultivated, from the very earliest periods of history; and during the present century, it has followed the footsteps of man, and become established in the American and Australian continents, and promises to become, especially in the latter, a most important introduction. The vine, like most cultivated plants, is capable of producing very numerous varieties, and these, of course, give rise to different qualities of wine; but far more influence is exerted upon the quality of the wine by climate, soil, and the position of the vineyard as to the sun's influence; so that we not only have wines peculiar to particular countries, but of those, again, we have usually very numerous varieties, produced by special causes within those countries; and in addition to all

these, again, we have other differences, produced by the degrees of skill in the manufacture. The earliest wines of which we have any account were made in Asia, but of these we know very little. Later on, we find abundant evidence of the high esteem in which wine was held by the Greeks, Romans, and other civilized contemporary nations; and the name of one of the choicest Roman wines has continued in use till the present time, viz., the Falernian. From what we learn from Pliny and other writers regarding the extraneous additions made by the Romans to their grape juice, and the treatment of the interior of their casks, we should much doubt whether even Falernian would be appreciated by the English palate. See the article "Vinum" in Smith's *Dictionary of Antiquities*. The mediæval history of wine is involved in much obscurity; but we find such abundant mention of sack and canary, that although we are not quite clear as to the exact history of those wines, we are not left in doubt as to the high appreciation felt for them by the priesthood and nobility of those times. The Greek islands seem to have furnished a large portion of the wine then consumed in Europe, and the merchant ships of Venice in the days of her glory appear to have been largely engaged in carrying Greek and Italian wines. The Malmsey of those times was not the produce of Madeira, but of the islands of Tenedos, Lesbos, Chio, and Candia.

Burgundy is the oldest wine-producing country of central Europe, and centuries ago the wine of this province was the choicest to be found on the tables of the rich and noble. Much of the Burgundy of the present day has excellent qualities—being of good body, velvety, and of delicate bouquet. A few scarce kinds, such as the Romanée-Conti, are really splendid wines. Claret or red wine, for the English market, is chiefly the produce of the Medoc district. It begins below Bordeaux, on the left bank of the Gironde, and stretches almost to the bay of Biscay. White wine, or sauterne, is also produced in the same neighborhood. The general character of the Bordeaux wines, which are of all qualities, is crispness, elegance, and fine bouquet, and they improve by keeping. Sparkling wine of great renown is produced in the Champagne, the finest qualities of which sell at exorbitant prices; but it would appear that in no other corner of the earth can wine of the same high character be obtained. See BORDEAUX, BURGUNDY, CHAMPAGNE.

Germany produces fine white but very few red wines. They are best known in the British market as hocks and Moselles, and are made both still and sparkling. They have much elegance and a racy flavor, but many wine merchants think they have scarcely the value claimed for them; nevertheless their high price shows that they are much in demand. At the Vienna exhibition of 1873, the jurors on the wine section had before them a sample of Rhine wine made in 1706, the year in which Marlborough gained the battle of Ramillies, another coeval with the war of American independence, and another of the year of the battle of Jena. But all these and others made in the early part of the century, before the days of "fortifying," had lost their characteristic taste and flavor, and were but the phantoms of what they had been. See HOCHHEIM, MOSELLE, and RUINE WINE.

The vineyards of Austria are extensive, and produce a great variety of wines, which are mostly consumed in the country itself, the red Vöslauer being the kind principally exported. Hungary is still more a wine-growing country, producing considerably more than it consumes, and is the home of the renowned tokay (q.v.), which boasts a high antiquity, and commands a more fabulous price than any other wine in the world. Ménéser-Ausbruch, Carlowitz, Ruster, Somlauer, and one or two others, are also favorably known. Hungarian wines are finding their way to English and other markets, but the long land-carriage operates as a serious check on the trade with England.

Perhaps the wines best known in Great Britain are the sherries of Spain and the ports of Portugal. The best kinds of the former are those technically called *dry*—that is, free from sweetness. Manzanillo is said to be the purest, but Montilla, Amontillado, and vino de Pasto are also famous kinds of sherry. This wine is chiefly shipped at Cadiz, near which it is made. The Malaga wines, both sweet and dry, are widely known, and from Catalonia come what are known in England as the Spanish reds. Port wine (q.v.) is mostly brought from Oporto, and its consumption in Great Britain has, as a rule, continued to increase for nearly two hundred years. The shipments of it had, however, fallen in 1858 to two million gallons; but from that time they gradually rose to the large annual total of seven million gallons in 1877, three-fourths of which were to England. For the ten years ending 1876, the average annual shipments of sherry from Spain amounted to nearly eight million gallons. Nearly all wines passing under the names of port and sherry are fortified, that is, dosed with brandy; but these form only a small portion of the wines produced in the Peninsula. Madeira, where twenty-five years ago the vineyards were almost totally destroyed by the *oidium fungus*, is now rapidly increasing the yield of its highly prized wine.

Italy, with great natural advantages, is behind several other nations in the production of fine and especially of sparkling wines; but the Barolo of Piedmont, the Chianti of Tuscany, the Orvieto of the Roman states, the lacryma Christi of Naples, and other special growths, have a high reputation. The celebrated Marsala, a wine with a sherry-like flavor, comes from Sicily. Not much Italian wine is exported, but the acreage occupied by the vineyards must be very large. The lesser wine-growing countries of Europe are Switzerland, Russia, Turkey, and Greece, which continues as in ancient

times to put resin in what is required for home consumption. Australia can already astonish the best French judges by the excellence of her wines, and the cape continues to yield her luscious Constantia and other growths of fine quality. The following table gives the annual yield of the more important wine-producing countries, but the great destruction caused in many districts since 1865 by the *phylloxera* (q.v.)—impairs the value of such a table:

	Gallons.
France, average from 1863 to 1873.....	1,176,000,000
Spain, mean of two estimates for 1873.....	450,000,000
Portugal, 1873.....	111,000,000
Germany.....	76,317,000
Austria, 1870.....	84,700,000
Hungary, 1873.....	221,214,000
Italy, 1873.....	750,000,000

The value of a full vintage in France, including the spirit distilled from the husks and stalks of the grape, amounts to the enormous sum of £76,000,000. Since the commercial treaty of 1860, which led to the import duty being fixed at one shilling per gallon on wines containing less than 26 per cent of proof spirit, a great increase has taken place in the consumption of French wines in Great Britain, nearly 7,000,000 gallons having been imported in 1877. But how little a wine-drinking people we still are is shown by the fact that the annual consumption of wine per head—over forty gallons—in Paris, is eighty times more than it is in the United Kingdom; our total imports of wine being a little under twenty millions of gallons in 1877, valued at £7,138,900.

With respect to the high prices realized by old wines of famous vintages, we may state that as much as £2 per bottle has occasionally been given for port and Tokay; and on one occasion a few years ago, two bottles of old Burgundy were sold at the very extraordinary price of £80 each.

Dietetic and Medical Value of Wines.—It may be laid down as a general rule that the use of wine, even in moderate quantity, is not necessary for young or adult persons enjoying good ordinary health, breathing fresh country air, and not exposed to overwork or any other abnormal depressing agency. As, however, life advances and the circulation becomes languid, wine in moderation becomes an essential, or at all events a valuable article of food; and even in earlier life the physician meets large numbers of townspeople, especially women engaged in sedentary occupations, who cannot digest the national drink, beer, which is admirably suited to our out-door laboring population, and to persons of higher rank who indulge freely in open-air exercises. In such cases the beer is replaced by the more grateful beverage tea, which, however, when taken too freely, and without sufficient solid food, gives rise to a form of distressing dyspepsia, which too often impels the sufferer to seek refuge in spirits. In many such cases cheap wine, which may be purchased under our new tariff at from 1s. 6d. to 2s. a bottle, mixed with an equal bulk of water, will be found an excellent substitute for the beer or tea. We shall first notice the medical uses of those numerous cheap French, German, and Italian wines which have been during the last few years so prominently brought before the attention of the British public by certain enterprising wine merchants; and then briefly notice the uses of the more expensive wines, such as port, sherry, champagne, etc. In the first department of the subject we shall take Dr. Druitt's *Report on Cheap Wines* as our chief authority, and we shall regard as cheap wines those whose price does not exceed 2s. 6d. a bottle. In prescribing wine, whether cheap or dear, the physician desires to give not merely alcohol, for that might be given far more cheaply under the form of gin or British brandy, but a compound liquid containing not only more salts or mineral ingredients than many a mineral water, but also the extractive parts of grape-juice, and the powerful oils and ethers which give to wine its special flavor or bouquet and its singular exhilarating properties. "The distinctive elements of wine," says Dr. Druitt, "are to be had in abundance in cheap Bordeaux, Burgundy, and other French wines; in Rhine wine; in the Hungarian, Austrian, and some Greek wine; and in all with a natural and not injurious quantity of spirit. In prescribing *pure wine*—i.e., light natural, virgin wine—the practitioner has a perfectly new article of both diet and medicine in his hands."—*Op. cit.*, p. 22. In cases of debility and indigestion, such wine as that which we are now considering, diluted with cold water, may often be freely prescribed with great advantage in place of tea at breakfast, as well as at luncheon or dinner, or dinner and supper, according as the patient arranges his meals. The best of the cheap wines are those of Bordeaux: they are pure, light, and exhilarating; moderately strong, seldom containing 20 per cent of alcohol; free from sugar and other materials likely to induce gout or headache; and are admirably adapted, according to Dr. Druitt (who has experimented largely upon them), for children with capricious and bad appetites, for literary persons, and for all whose occupations are chiefly carried on indoors, and which tax the brain more than the muscle. They should be taken *at*, not *after*, meals; and in many cases, when judiciously prescribed, they will be of more service to patients suffering from anæmia, chlorosis, dyspepsia, or gouty or rheumatic tendencies, than any form of medicine. The Bordeaux wines are, moreover, of great

use in relieving the restlessness, nightly wandering, and thirst that accompany scarlet fever and measles in children; one part of wine with one or two of cold water, according to age, being an excellent drink, acting at once as a diaphoretic, saline, and sedative. The Burgundy wines are fuller, stouter (on an average from 2 to 4 per cent stronger in alcohol), and higher flavored than the Bordeaux of equal price. The cheap Burgundies are inferior to the Bordeaux as medicinal agents; but the higher-priced wines (at and above 4s. a bottle) are of extreme service in cases of debility with nervous exhaustion, and, as Dr. Druiitt remarks, "what Bordeaux is to the blood, that is Burgundy to the nerves." Some of the Hungarian wines which are being now introduced into England are excellent substitutes for Bordeaux; and not having the acidity, austerity, and coldness of the latter, are often preferred by patients. Among the most important of the *dearer* kinds of wine are port, sherry, and champagne. Good old port is a tonic of great value in cases of fever and other forms of extreme debility; but many persons past 40 dare not take it if they have any predisposition to gout. Port wine given with warm water, administered with a biscuit at bedtime, often induces a good night's rest during convalescence from fevers or other weakening diseases. But during the last 30 or 40 years its price has risen from 30 to 100 per cent; and the port purchased at a vintner's by a poor invalid at 4s. a bottle is usually nothing but doctored British spirit that has been sent to Hamburg to be transmuted into wine. In place of good port, now unattainable by the poor, the physician had better prescribe good British brandy if a strong stimulant be required, or such wines as the Hungarian Ofter or French Madeira if it is the nutritive value of wine that is required. Sherry is, in a dietetic point of view, the wine in most general use in England, and if pure it agrees well with most constitutions. It is the only wine admitted into the pharmacopœia, in which it is employed in the composition of aloetic, antimonial, colchicum, and other medicated wines. It is a wine that suits the stomach in many cases of dyspepsia, but it is not often prescribed medicinally. Champagne is a wine that acts as a most valuable medicine in cases of vomiting, irritable stomach, etc., and when the appetite flags and there is great general debility. Genuine Tokay is so rare a wine that it is almost unnecessary to notice it; it is, however, when procurable extremely valuable as a cordial for aged persons of broken-down constitution. See AMERICAN WINES, FRENCH WINES, GERMAN WINES, GREEK WINES, ITALIAN WINES, PORTUGUESE WINES, SPANISH WINES.

WINEBRENNER, JOHN, 1797-1860; b. Md.; was originally a minister of the German reformed church, and had charge of four small congregations at Harrisburg, Penn., 1821; withdrew, 1830, with some other preachers, and formed a new sect, which they called the *Church of God*, but generally termed Winebreunerians (q.v.). The church has three positive ordinances, baptism by immersion, feet-washing, and the Lord's-supper. For several years Mr. Winebrenner edited the *Church Advocate*. He published *Regeneration; Brief View of the Church of God; Liturgical Hymn Book; Practical and Doctrinal Sermons*.

WINEBRENNERIAN, or THE CHURCH OF GOD, a denomination of Baptists in the United States, organized, 1830, at Harrisburg, Penn., by John Winebrenner, formerly a minister of the German reformed church. Their doctrines are a belief in the Bible as the authoritative revelation of God; in the trinity, in human depravity, in the vicarious atonement, the freedom of the will; they reject Calvin's doctrine of election; they consider faith and immersion essential to baptism; that the ordinance of feet-washing should be practiced by all Christians, and that the Lord's-supper should be often administered. The church has a domestic and foreign missionary society, and a printing establishment at Harrisburg, Penn. They have several colleges, 400 churches, 550 ministers, and 30,000 members.

WINES, ENOCH COBB, D.D., LL.D., 1806-79; b. N. J.; graduated at Middlebury college, 1827; took charge of Edge Hill school, Princeton, N. J., 1833; was made professor of languages in the Philadelphia high school, 1838; had a boarding school at Burlington, N. J., 1844-48; became a Congregational preacher, 1849; and was pastor at Cornwall, Vt., and Easthampton, L. I.; professor of languages in Washington college, Penn., 1853; president of St. Louis university, 1859; secretary of New York prison association, 1862; and of National prison association, 1870; went to Europe as a representative of the national government and assembled the first international congress on prison discipline, 1871-72; was chairman of a commission which met at Brussels, 1874, and at Bruchsal, 1875; made arrangements for a second international congress at Stockholm, 1877. Of his published works the principal is *Commentaries on the Laws of the Ancient Hebrews*.

WINGATE, CHARLES FREDERICK, b. N. Y., 1847; for some time a N. Y. correspondent of the *Springfield Republican*. He was subsequently connected with the *House-keeper*, which he founded, the *N. Y. Express*, the *Plumber and Sanitary Engineer*, and other journals. He is now (1881) a consulting sanitary engineer in New York. He published *Views and Interviews on Journalism* in 1875.

WINN, a parish in n.w. Louisiana, partly bounded on the e. by the Castor bayou, on the w. by the Saline bayou, drained by the Dugdemona river: 1000 sq.m.; pop. '80, 5,846—2,835 of American birth, 1049 colored. Co. seat, Winfield.

WINNEBAGO, a co. in n. Illinois, having the state line of Wisconsin for its n. boundary; 520 sq.m.; pop. '80, 30,518—23,930 of American birth, 144 colored, drained by the Rock river and its tributaries. Co. seat, Rockford.

WINNEBAGO, a co. in n. Iowa, having the state line of Minnesota for its n. boundary, drained by the head-waters of Iowa river; 432 sq.m.; pop. '80, 4,917—2,946 of American birth, 1 colored. Co. seat, Forest City.

WINNEBAGO, a co. in central Wisconsin, bounded on the e. by Winnebago lake, drained by Fox and Wolf rivers and large lakes in the n. portion; 450 sq.m.; pop. '80, 42,741—30,453 of American birth, 182 colored. Co. seat, Oshkosh.

WINNEBAGO; lying to the e. of Winnebago co., Wis., and entirely comprised within the state. Its area is about 220 sq.m., its length 30 m., and its greatest width 11 miles. The chief ports are Oshkosh, Fond du Lac, and Menasha; the lake is navigated by steamboats.

WINNEBAGOES, a tribe of Indians belonging to the Dakota family. They were, in early times, found about Green bay. Early in the 17th c. they were attacked by a strong alliance of other tribes, defeated, and terribly reduced in numbers. In the French and Indian war they were allies of the French, but during the revolution aided the British forces, and again in 1812. They took part in the Miami war, and were defeated by Wayne. In 1826-27 they made treaties fixing their boundaries, but intrusion on their territory was common; murder of whites followed, and by the treaty of 1832 they gave up all their lands on the Wisconsin and Fox rivers. A reservation was provided for them on the Mississippi, n. of the Iowa. They were removed again in 1846, not to the reservation promised them, n. of the St. Peters, but to one near the Wataub, a shameful transaction. In 1855 they were moved to Crow river, and in 1856 to Blue Earth, Minn., where they were advancing in civilization when the Sioux war broke out, and the whites urged their removal. Again they were taken to an unsuitable place, Crow creek, Dakota, and the greater part fled to the Omaha reservation. In 1866 they were given land at Winnebago, Neb., and in 1869 were placed under the charge of the Friends. They have since advanced greatly in civilization. They now number about 1500.

WINNESHIEK, a co. in n.e. Iowa, having the state line of Minnesota for its n. boundary, drained by the Upper Iowa, the Turkey, and other rivers; 720 sq.m.; pop. '80, 23,937—16,071 of American birth, 17 colored. It produced in one year 1,479,331 bushels of wheat. Co. seat, Decorah.

WINNIPEG, the largest of the lakes belonging wholly to British North America, lies 60 m. n. of the state of Minnesota, and about 350 m. n.w. of lake Superior, in lat. 50° to 54° n., 96° to 100° west. It is 264 m. long, 35 m. broad, has an area of 9,000 sq.m., and lies 628 ft. above sea-level. It is connected by navigable channels with lakes Winnipegosis and Manitoba, which lie to the w., and run almost parallel with it. Its tributaries drain an area of 400,000 sq.m. Of these the largest is the Saskatchewan (q.v.), which flows eastward from the Rocky mountains, through a rich alluvial country, and joins the lake near its northern extremity. The Winnipeg river, 300 m. long, and flowing in a north-westerly direction, connects lake Winnipeg with the lake of the Woods and Rainy lake. The Red river and its great branch, the Assiniboine, discharge their waters at the southern extremity of lake Winnipeg, after flowing through the region to the s. and s.w.—a region which presents a singular and important combination of prairie and woodland. Nelson's river, issuing at the north end of lake Winnipeg, is its principal outlet.

WINNIPEG, capital of the Canadian province of Manitoba, stands at the confluence of the Assiniboine with the Red river, 50 m. s. of lake Winnipeg. Formerly known as fort Garry, from the Hudson's bay company's post so called, it was incorporated as the city of Winnipeg in 1873. The population, then about 2,500, was in 1879 close on 10,000—a fair index of the prosperity of the town. The principal buildings are the government offices, city hall, post office, custom-house, the various banks, and the churches, of which, in 1878, there were eight. The university of Manitoba includes a Presbyterian, an Episcopal, and a Roman Catholic college. Winnipeg stands on the line of the Canadian Pacific railway, and is connected through the Red river valley with the rail ways of the United States.

WINNIPEGOSIS or **(LITTLE WINNIPEG). LAKE**, in British North America, emptying into lake Manitoba, s.e. of it, by Water Hen river; about 2,000 sq.m.; Red Deer and Swan rivers, and lake Dauphin empty into it. Its length n. and s. is about 120 miles. It is shallow, navigable for vessels drawing 10 ft. of water.

WINNIPISGEE, **WINNIPISCIO GEE**, or **WINNIPESAUKEE**, a beautiful lake of New Hampshire, 25 m. long, and of varying width, with deep bays, bold promontories, and numerous islands. Its crystal waters are stored with fish; and surrounded by picturesque hills, it is a favorite resort of tourists to the White mountains.

WINONA, a co. in s.e. Minnesota, having the Mississippi river on the n.e., separating it from Wisconsin, drained by the Minnesota and affluents of Root river; 650 sq.m.; pop. '80, 27,197—18,814 of American birth, 72 colored. Co. seat, Winona.

WINONA, a city in Minnesota, the co. seat of Winona co., on the w. side of the Mississippi river, and on the Chicago, Milwaukee and St. Paul, the Winona and St. Peter, and the Madison division of the Chicago and North-western railroad; pop. '80, 10,208. It stands on level ground, inclosed by high bluffs, and is regularly laid out, with wide streets, containing many fine business buildings and private residences. It contains the state normal school and a high school, both with elegant buildings; a court house, banks, and 5 newspapers, of which one is a daily. An iron railroad bridge crosses the Mississippi at this point. Winona is one of the chief shipping places for lumber and grain in the west. Its shipments of grain are second to only those of Milwaukee and Chicago. Its shipments of wheat average 6,000,000 bushels yearly. Among its manufactories are foundries, flour-mills, carriage shops, steam barrel factories, saw-mills, sash and door factories. It was settled in 1851, and received a city charter in 1857.

WINSLOW, EDWARD, 1595-1655; b. England; member of a good Worcestershire family. He was well educated, and while making a tour on the continent became acquainted with John Robinson, minister of the Independent church in Leyden, which had separated from the church of England. Winslow became a member of the Leyden congregation, and in 1620, with his wife and brother, sailed in the *Mayflower*. He was one of the party that landed at Plymouth. His wife died that winter, and his marriage with Mrs. Susannah White was the first in New England. In 1623 he revisited England as agent of the Plymouth colony. He became a magistrate the next year, went to England again in 1625, and was elected governor in 1633. While on a visit to England in 1635 he went before the council and prevented an attempt to destroy the self-government of the Plymouth colony. The same year he was imprisoned for 17 weeks by Laud on the charge of giving instruction in the church, being a layman, and of performing civil marriage. He was governor again in 1633, 1636, and 1644. During his last visit to England, in 1649, he became one of the founders of the society for propagating the gospel in New England. In 1655 he was appointed by Cromwell one of three commissioners to take charge of an expedition against the Spaniards in the West Indies, but he died on the voyage. Among his works are *Good Newses from New England* (1624); and *Hypocrisie Unmasked* (1646).

WINSLOW, FORBES BENIGNUS, D.C.L., 1810-74; b. London; studied medicine in New York, then at the Royal college of surgeons, and at Aberdeen. He made a specialty of the treatment of insanity, and was for some time superintendent of a private asylum at Hammersmith. He then devoted himself entirely to consultation-practice in London. He founded in 1848 the *Quarterly Journal of Psychological Medicine and Mental Pathology*. Among his works are: *The Anatomy of Suicide* (1840); *Plea of Insanity in Criminal Cases* (1843); and *Obscure Diseases of the Brain and Disorders of the Mind* (1862).

WINSLOW, HUBBARD, D.D., 1799-1864; b. Vt.; graduated Yale college, 1825; studied theology, New Haven; pastor of First church (Cong.), Dover, N. H., 1828-31; of Bowdoin street church, Boston, 1832-44; traveled in Europe; principal of Mount Vernon young ladies' institute, Boston, 1844-53; edited the *Religious Magazine*; preached at Geneva, N. Y., 1857-59; pastor of 50th street Presbyterian church, New York, 1861. He published: *Controversial Theology*; *Young Men's Aid*; *Doctrine of the Trinity*; *Christianity Applied to our Civil and Social Relations*; *Intellectual Philosophy*; *Moral Philosophy*; *Appropriate Sphere of Woman*; *Relations of the Natural Sciences to Revelation*.

WINSLOW, JOHN A., 1810-73; b. N. C.; entered the navy as midshipman, 1827. In the Mexican war he took part in the attack on Tobasco as lieutenant of the *Cumberland*. In 1861 he had command of the Mississippi flotilla, and was present at fort Pillow. In 1863 he took command of the *Kearsarge*, and in June, 1864, waited off the Cherbourg harbor for the famous confederate privateer *Alabama*, which came out from the neutral port in response to his challenge. The *Kearsarge* was protected by chain armor and met with little loss. The *Alabama* was sunk, and her capt., Semmes, escaped in an English yacht. Winslow was made commodore for this success, 1864, and rear-admiral in 1870.

WINSLOW, JOSIAH, 1629-80; b. Marshfield, Mass.; had command of the military band, and in 1656 captured Alexander, the son of Massasoit, and restored security to the colony. In 1675 he was appointed general-in-chief of the forces of the united colonies raised for king Philip's war, and held the position until 1671. He was governor's assistant in 1673, and the same year became governor of Plymouth.

WINSLOW, MIRON, D.D., LL.D., 1789-1864; b. Vt.; descendant of Kenelm Winslow, who came from England in the *Mayflower*; graduated at Middlebury college, 1815; Andover theological seminary, 1818; married Miss Harriet Wadsworth Lathrop of Norwich, Conn.; sailed for Jaffna, India, from Boston, June 8, 1819, as a missionary of the American board; with Mrs. Winslow he established the Oodooivik seminary for girls, 1822. After her death he sailed for America in 1823, having in charge ten little girls, from the missionary families, sent for education to America. Returning, he established in 1837 the American mission in Madras. To the main work of preaching the gospel to the natives, and teaching and superintending native schools, he added the preparation of school and reading books in Tamil, assisted also in the translation of the Bible, wrote

some works on missions, and contributed occasionally to American and European periodicals. His chief literary work was a dictionary of the Tamil and English languages, completed in 1862. It was in part based on materials in manuscript left by the rev. Joseph Knight of the London missionary society, and the rev. Samuel Hutchings of the American mission. It contained 67,453 words in both high or poetical, and low or common Tamil. It is said to be the most elaborate and complete dictionary hitherto prepared in any of the languages of India, except the Sanskrit lexicon of prof. Wilson. Prompt and firm in judgment, dignified and courteous in manner, he commanded marked respect from the natives and from English officials in India. After 44 years' service in India, he died at the cape of Good Hope on his third voyage toward America.

WINSOR, JUSTIN, b. Boston, 1831; graduated at Harvard, and continued his studies at Paris and Heidelberg. He was superintendent of the Boston public library, 1868-78, when he was appointed librarian of Harvard university. He is one of the most eminent librarians in the United States, and has done much to increase the efficiency of libraries. Besides many bibliographical lists and catalogues he has written several books. He is the editor of *The Memorial History of Boston* (1881).

WINSTED, a borough of Winchester township, Litchfield co., Conn.; 28 m. n.w. of Hartford, on the Naugatuck and the Connecticut Western railroads; and on Mad river, the outlet of Long Lake, which furnishes water-power; pop. '80 of township, 5,142. The borough includes Winsted and West Winsted. There are extensive manufactures of cutlery, hardware, tools, clocks, and silk.

WINSTON, a co. in n. Alabama, drained by Sipsey creek, the Blackwater, and other small rivers; 1040 sq.m.; pop. '80, 4,253-4,252 of American birth, 17 colored. Co. seat, Houston.

WINSTON, a co. in central Mississippi, drained by the head-waters of the Pearl river; 725 sq.m.; pop. '80, 10,087-10,660 of American birth, 3,974 colored. Co. seat, Louisville.

WINSTON, JOSEPH, 1746-1814; b. Va. In 1760 he was engaged in frontier Indian warfare, and was pensioned for gallant conduct. In 1776 he commanded a regiment which marched against the Cherokees and Tories; and he commanded the right wing at the battle of King's Mountain. He was a member of congress, 1793-95, and 1803-7.

WINTER. See *SEASONS*, *ante*.

WINTER-GREEN, the popular name of plants of the genera *pyrola* and *chimaphila*, of the natural order *pyrolaceae*, which, according to some botanists, is a sub-order of *ericaceae*, distinguished chiefly by difference of habit, but also by declinate styles, seeds with a loose winged skin, and a minute embryo in the base of fleshy albumen. Only about twenty species of *pyrolaceae* are known. They are natives of woods throughout the whole of the northern hemisphere, and are herbaceous or half-shrubby plants, with a corolla of four or five segments, which are almost petals, but are slightly united at the base. Several species of *pyrola* are natives of Britain, perennial herbaceous plants, with flowers of some beauty. Two species of *chimaphila*, half-shrubby plants, with beautiful evergreen leaves, natives of North America, *C. umbellata* and *C. maculata*, are valued for their tonic, diuretic, and narcotic qualities, and are used in dropsy, calculus, strangury, and other diseases.

WINTER, WILLIAM, b. Mass., 1836; graduated at the Harvard law school; removed to New York in 1859; was a writer for *Vanity Fair*, memoirs of two of whose best known contributors, George Arnold and Fitz-James O'Brien, he has since published; he wrote the dramatic criticisms for the New York *Albion*, 1861-65. He has since been dramatic editor of the New York *Tribune*. He has published *My Witness*, and other volumes of poems; and has just finished (May, 1881), a work on the Jefferson family of actors.

WINTERBERRY, a name applied to two species of *ilex*, *I. verticillata*, or black alder, and *I. latifolia*, or smooth winterberry, and therefore closely related to *I. glabra*, or ink-berry (q.v.) and *I. cassine*, or yaupon (q.v.), and to the holly (q.v.), *I. opaca* (Gray). Indeed they all belong to the holly family (*aquifoliaceae*). See *HOLLY*, *ante*. The common winterberry, or black alder has obovate, oval or wedge-lanceolate leaves, serrate, downy on the veins beneath; flowers which appear in May and June, are all very short peduncled. It grows on moist, preferably rich ground, from 6 to 12 ft. high, bearing in November great quantities of brilliant crimson or scarlet-crimson berries, which are often gathered and used as vase ornaments or wreaths. If carefully dried they retain much of their brightness for some time. The smooth winterberry (Gray) has lanceolate or oblong-lanceolate leaves, pointed at both ends, shining above, beneath mostly glabrous. It grows in wet grounds from Maine to the mountains of Virginia. Fruit larger, and ripening earlier in the autumn.

WINTERGREEN, OIL OF, or *gaultheric acid*, is an essential oil yielded by the flowers of the *gaultheria procumbens* (see *GAULTHERIA*), abundant in New Jersey, and consisting chiefly of salicylate of methyl ($C_2H_5O, C_{14}H_5O_5$), mixed with a small quantity of a hydrocarbon, termed *gaultherilene*, which is isomeric with oil of turpentine, and which, being more volatile than the salicylate of methyl, is easily separated from it. The latter is so

much the more abundant constituent of the oil, that the two may be practically regarded as identical. This oil is not only yielded by the distillation of other plants, as the leaves and flowers of *monotropa hypopitys*, and the bark of *betula lenta*, but may be artificially formed by distilling a mixture of 2 parts of crystallized salicylic acid, 2 of anhydrous wood-spirit, and 1 part of oil of vitriol. In whatever mode it is obtained, it presents the appearance of a colorless or yellow oil, of a powerful, agreeable, and persistent odor; and hence it is largely used in perfumery.

WINTERHALTER, FRANZ XAVER, 1806-73; b. Baden; studied art at Freiburg and Munich, and in Italy. He became a fashionable portrait painter, and among his sitters were queen Victoria, the prince of Wales, and the empress Eugénie. He also painted groups of the royal family of England and of the French court. Of his pictures other than portraits "Dolce far niente" and "Roderick the Goth seeing Florinda for the First Time," are generally considered the best.

WINTER MOTH *Chimantobia brumata*, a species of moth, the caterpillar of which is very injurious to plum trees. It has long been well known as common in many parts of the continent of Europe, and has of late begun to be very abundant also in some parts of England, as in the vale of Evesham, in Worcestershire, celebrated for its plum plantations, where damage has been done by it to the extent of £20,000 or £30,000 in a year. It is an insect about half an inch long, of a light-brown color. The male alone has wings; the female, as in a few other moths, is wingless. The eggs are hatched early in spring, and the caterpillars, at first very minute, feed upon the buds of the plum. The eggs are deposited on trees, chiefly around the base of the buds, and in cinks of the bark. Like most of the moths, this insect is nocturnal in its habits. It is during night that the males fly about the trees, and the wingless females creep up their stems. The best mode of preventing its ravages is to surround the stems of the trees with something over which the females cannot climb from the ground, in which they pass their chrysalis stage. Boxes are used for this purpose in Germany, in which the ascending insects are trapped. A more easy method is to coat the trees with a composition of tar and grease in the beginning of winter, the time at which these moths appear in their perfect state, and when, of course, the laying of eggs takes place. By visiting the plantation of plum trees with a lantern at this season, the gardener is often also successful in killing great numbers of them.

WINTER'S BARK, a stimulant, aromatic, and tonic bark, resembling cinnamon, and used for the same purposes. It derives its name from capt. Winter, who first brought it from the strait of Magellan in 1579. It is the produce of *drimys Winteri*, a native of some of the mountainous parts of South America, and abundant in the lower grounds of cape Horn and Staten island—an evergreen shrub with laurel-like leaves, corymbs of white flowers, and many-seeded berries. This shrub belongs to the natural order *magnoliaceae*, and to a section of it which has by some been constituted into a separate order, *Winteraceae*, chiefly distinguished by dotted leaves and aromatic qualities. The star anise (*Illicium*) is nearly allied to it. The bark of other species of *drimys* has similar properties to Winter's bark, as that of *D. granatensis*, much used in Brazil as a remedy for colic, and of *D. axillaris*, a New Zealand tree.

WINTERTHUR, one of the most industrious and beautiful of the smaller towns of Switzerland, in the canton of Zurich, stands on the Eulach, 14 m. n.e. of Zurich. Its situation among hills, many of which are clothed with vines, is specially pleasant. Cotton-spinning, cotton-printing, dyeing, and the manufacture of machinery and weapons, are actively carried on. Pop. '70, 9,404.

WINTHROP, FITZ JOHN, 1638-1707; b. Ipswich, Mass.; son of gov. John of Conn.; educated in England. He held a military commission under Richard Cromwell, but at the restoration returned to Connecticut; served in king Philip's war; was a member of governor Andros's council, and a magistrate, and in 1698 was appointed maj.gen. of the Canada expedition. From 1693 to 1698 he was the British agent in the colony, and gave great satisfaction. From 1698 until his death he was governor of Connecticut.

WINTHROP, JAMES, LL.D., 1752-1821; b. Mass.; graduated at Harvard, 1769, where he was librarian, 1772-87. He was wounded at Bunker's hill. After the revolution he was chief justice of the state court of common pleas. He wrote books in regard to Scriptural prophecies, and was a contributor to the *Literary Miscellany*.

WINTHROP, THEODORE, 1828-61; b. New Haven, Conn.; graduated at Yale college. He spent some time in a New York counting house, and at Panama. He accompanied Lieut. Strain's expedition to the isthmus of Darien, suffering hardships which seriously impaired his health. He afterward practiced law for a short time in St. Louis, but soon returned to New York. He now wrote tales and stories, none of which were published until after his death. Early in 1861 he went to Washington with the 7th New York regiment. He was soon made military secretary to gen. Butler, with the rank of maj. He was killed at the battle of Great Bethel, June 10, 1861, at the head of the assault upon the confederate left. His works, of which a complete edition with a memoir by his friend George William Curtis, has been published, are: *Cecil Dreeme*; *John Brent*; *Edwin Brothertoft*; *Canoe and Saddle*; and *Life in the Open Air*.

WINTHROP FAMILY.—JOHN, governor of the colony of Massachusetts, was born in Groton, county of Suffolk, England, Jan. 12, 1588; was bred to the law, appointed justice of the peace at the age of 18, and on account of his excellent and pious character, was, in 1629, elected by the governor and company of Massachusetts bay to govern their colony. He sold his estate, and April 7, 1630, sailed from Yarmouth with 900 persons. During the voyage he composed an essay, entitled *A Model of Christian Charity*. He was re-elected governor every year until 1634, when he became deputy-governor under sir Harry Vane, with whom he had an animated controversy on the doctrines of Mrs. Hutchinson. In 1637 he was elected over sir Harry, and continued governor, with a brief interval, during his life, and had more influence probably than any other man in forming the political institutions of the northern states of America. He was opposed to an unlimited democracy, for he said, "The best part of a community is always the least, and of that best part the wiser part is always the lesser." He kept a journal up to 1649, two books of which were published in 1790; and the third, found in the New England library, kept in the tower of the Old South church in Boston, in 1816. A revised edition was published at Boston, in 2 vols. (1825-26). He died at Boston, Mar. 26, 1649.

—JOHN, governor of Connecticut, son of the preceding, was born at Groton, England, Feb. 12, 1606; educated at Trinity college, Dublin; made the tour of Europe; went to America in 1631, was chosen a magistrate in Massachusetts, but returned to England; and in 1635 went to Connecticut, built a fort at the mouth of the Connecticut river, was made governor of the colony, and founded the city of New London in 1661. He obtained a charter for the colony from Charles II., and was first appointed governor under it; and, in 1676, represented his colony in the congress of the united colonies at Boston. He was a man of eminent virtues, and considerable acquirements. Some of his papers are contained in the *Philosophical Transactions*. He died at Boston, April 5, 1676.

—JOHN, LL.D., American scholar, a descendant of the first governor Winthrop, was born in Massachusetts, 1715; graduated at Harvard college, 1732; and in 1738 was appointed Hollis professor of mathematics and natural philosophy. In 1749 he observed the transit of Mercury; and, in 1761, went to Newfoundland to observe the transit of Venus. He published tracts on earthquakes, comets, and other astronomical subjects. Died at Cambridge, May 3, 1779.

—ROBERT CHARLES, LL.D., American statesman and orator, descendant of the sixth generation from the first governor Winthrop, was born at Boston, May 12, 1809, graduated at Harvard college in 1828, studied law with Daniel Webster, and was admitted to the bar in 1831, but soon abandoned law for politics, and was elected to the state legislature in 1834, where he served five years, three as speaker of the house. In 1840 he was elected to congress, of which he was a member for ten years. In 1847 he visited Europe, and was the whig candidate for speaker, but defeated after a balloting of three weeks. In 1850 he succeeded Mr. Webster, who became secretary of state, as senator from Massachusetts, a place in which he was succeeded by the more radical Charles Sumner. He was also defeated as a candidate for governor of Massachusetts. He published *Life of J. Winthrop*, *Memoir of N. Appleton* (1861); *Speeches* (1853-67); and *Washington, Borden, and Franklin* (1876).

WIRE AND WIRE-DRAWING. The facility with which any metal can be drawn into wire depends upon its ductility. Most metals have this property; but some, like bismuth and antimony, are so brittle that they can only be drawn out with difficulty, and wire made from such metals is useless, from want of tenacity. See DUCTILITY.

Metals largely used for making wire, such as iron, brass, and copper, are drawn by essentially the same process. We may take iron as an example. It is prepared by cutting up flat rolled plates into square rods of a given thickness. This is done by means of a pair of slitting rollers; one of these has grooves, equal to the breadth of the rods wanted, fitting into corresponding grooves in the other, which cut up the metal like scissors. The rods are cleaned of scales of oxide, either by mechanical rubbing, or by chemical treatment with dilute sulphuric acid. If the rod is thick, it has its square edge taken off by rollers. It is then drawn into wire by forcing it through the hole of a *draw-plate*. This is an oblong piece of hard steel pierced with conical holes, gradually diminishing in diameter, and having the smallest ends of these tapering holes carefully prepared to the required size. Sometimes cubical shaped dies, each with a single trumpet-shaped hole, are used. Motion is given to the drawing-block or cylinder by means of beveled wheels connected with a shaft driven by steam or water-power.

The workman commences by making a point on the rod, so as to allow it to pass through the hole, and be grasped by a pair of pincers attached to a chain, which draws it out till the length is sufficient to pass round the cylinder. This much is done by hand, and then the cylinder, being put in gear, is made to revolve and pull the wire through the draw-plate—coiling it round itself as the drawing proceeds. After being once drawn, it is again passed through a smaller hole, and so the process is repeated till it has been reduced to the size required. Fine wire may require from 20 to 30 drawings. The cylinder revolves slowly with a thick wire, and the speed is increased as the size diminishes. After being passed a few times through the draw-plate the metal becomes brittle, and requires to be annealed. Sometimes, a lubricating substance—as wax, grease, or soap—is employed during the drawing, especially for fine wires.

For some very accurate purposes, such as chronometer springs, and for gold and silver lace, the wire is drawn through jeweled holes, that is, holes perforated in rubies and other hard gems. A silver wire 170 m. long, and about $\frac{1}{8000}$ of an inch in diameter, has been drawn through a hole in a ruby, and found, by a micrometer, to be of exactly the same size at the end as at the beginning; whereas the drawing of a length of 16 m. of brass wire through a steel draw-plate necessitates a readjustment of the hole.

Platinum wire can be drawn as thin as $\frac{1}{32000}$ of an inch in diameter by first encasing it in silver, drawing down the compound wire, and then dissolving off the silver with nitric acid. By the same process gold wire can be obtained only $\frac{1}{80000}$ of an inch in diameter. It has been shown by Babbage, as an illustration of how greatly labor increases the value of a raw material, that one pound of iron, which costs twopence, will yield 50,000 wire pendulum springs for watches, each weighing about one-seventh of a grain, and selling at the retail price of twopence.

Wire, although mostly cylindrical in form, is drawn of many different sections, such as oval, half-round, flat, triangular, molded, and the grooved pinion-wire from which the small toothed pinions for clocks and watches are cut. Copper wire of different forms is used to form patterns in the blocks used by calico printers.

The following table (given by Dr. Tomlinson) of weights, omitting fractions of a pound, which were sustained by wires 0.787 of a line in diameter, shows the comparative tenacity of a few of the metals: Iron, 549 lbs.; copper, 302 lbs.; platinum, 274 lbs.; silver, 187 lbs.; gold, 151 lbs.; zinc, 110 lbs.; tin, 35 lbs.; lead, 28 lbs. It may be remarked here that some kinds of brass wire have been noticed to become extremely brittle in the course of time, especially if subjected to vibration, and even to break when used to support objects, without any assignable cause.

The quantity of wire used in the English manufacturing districts must be enormous, steel and iron wire being required for the manufacture of needles, fish-hooks, hooks and eyes, carding-machines, screw-nails, fencing, and basket-work; brass wire for the manufacture of pins, wire cloth for paper making and other machines, and chain-making; and copper wire for bell-hanging. Nothing, however, has increased the production of wire, both iron, and copper, more than the electric telegraph. Belgium, which a few years ago exported none, now exports 1200 tons annually of iron wire.

WIRE-ROPES have come greatly into use of late years for winding purposes in mines and on inclines, for the rigging of ships, and for numerous engineering contrivances; also for the construction of electric-telegraph cables. They are almost always "galvanized," that is, coated with zinc. A hemp rope 6 inches in circumference, and weighing 3 lbs. per fathom; an iron-wire rope $2\frac{3}{8}$ inches in circumference, and weighing 5 lbs. per fathom; and a steel-wire rope $1\frac{1}{2}$ inch circumference, and weighing 3 lbs. per fathom, are all of equal strength—the breaking strain of each being 10 tons.

WIRE-WORM, a name given by farmers and gardeners to the larvæ of click beetles (q. v.), which are long and hard, and often swarm in corn fields, gardens, and pastures, feeding on the roots of crops, and doing great mischief. The best known British species are *elater* or *agriotes lineatus*, *E.* or *A. obscurus*, and *E.* or *A. sputator*. The first of these, which is the largest, is in its perfect state about half an inch long, with brown head and thorax, clothed with cinereous down; the elytra tawny, striped with brown. The larva, when full grown, is fully half an inch long, very narrow, yellowish, hard, and shining, the jaws tipped with black. The second species named is in its perfect state of an earthy-brown color. The third has a black head and thorax, with many dots, the elytra light brown, with dotted lines. It is only about a quarter of an inch in length. Wire-worms are very small when first hatched, and are said to live for years in the larva state. Moles, rooks, and pheasants are useful in destroying them. Clover crops are said to have the effect of increasing their numbers. Farmers and gardeners resort to various means in order to get rid of this pest, as hard rolling after a top-dressing of lime, and mixing spirits of tar, gas-lime, or rape-cake with the soil; but one of the most effectual is the strewing of slices of potatoes or turnips on the ground, under which they soon congregate, and great numbers are thus easily destroyed. The name wire-worm is often very vaguely used, so as to include not only the larvæ of some moths, but even myriapods of the genus *julus* (q. v.) which somewhat resemble the true wire-worms in form, although in reality very different, and probably not injurious to crops, as they are.

WIRT, a co. in w. West Virginia, bounded on the n. by Hughes river; drained by the little Kanawha; 260 sq. m.; pop. '80, 7,104—7,059 of American birth; 13 colored. Petroleum is largely exported. Co. seat, Elizabeth.

WIRT, WILLIAM, LL.D., 1772-1834, b. Md.; son of a Swiss father and a German mother. He began to practice law at Culpeper Court-house, Virginia, in 1792; 7 years later he was elected clerk of the Virginia house of delegates. For a short time in 1802 he was chancellor of the e. district of Virginia, but he soon resigned. Removing to Richmond in 1806, he gained high reputation at the bar in the trial of Aaron Burr in 1807. He represented Richmond in the house of delegates, 1807-8, where he was a warm supporter of Jefferson. In 1816 he became U. S. attorney for the district of Virginia, and he was attorney-gen. of the United States, 1817-29, when he settled in Baltimore. In 1832 he received the anti-masonic nomination for president of the United

States. His *Letters of a British Spy* containing sketches of popular orators appeared in the *Argus* for 1803. Better known is *Life of Patrick Henry* (1817).

WISBECH, or **WISBEACH**, a market-t. in Cambridgeshire, in the isle of Ely, occupies a position of importance in the Fen district, on the Nen, 18 m. e.n.e. of Peterborough. Wisbech is a busy and prosperous place. Its principal buildings are the church of St. Peter and St. Paul, lately restored; the corn-exchange, the town-hall, the cattle-market, and the new schools. Wisbech is connected with the Great Eastern, the Great Northern, and the Midland railways. By the Nen, which falls into the Wash, at the distance of 12 m. below Wisbech, communication is maintained between this town and the North sea. The navigation of the river has been much improved within recent years, and Wisbech is considered the port of Cambridgeshire. It is generally well built, contains a number of useful institutions, and carries on rope-spinning, brewing, and general trade. Corn, timber, wool, salt, and seeds are exported; wine, deals, oil-cake, corn, slates, and coal imported. In 1876, 481 vessels, of 70,029 tons, entered, and 324, of 48,456 tons, cleared the port. Pop. '71, 9,362.

WISBY, a once famous sea-port of the Swedish island of Gothland (q. v.) capital of the island, and situated on its w. coast, about 130 m. s. of Stockholm. It is of the highest historical and antiquarian interest; and though the time of its foundation is unknown, it was during the 10th and 11th centuries (200 years before the establishment of the Hanseatic league in 1241) one of the most important commercial cities in Europe. It was a principal factory of the Hanseatic league during the 14th and 15th centuries. The eastern trade, which during the 11th and 12th centuries passed through Russia, and thence down the Baltic to Gothland, centered in Wisby, and greatly enriched that port. In 1361 Valdemar III. of Denmark took the town by storm, and plundering it, obtained an immense booty. This was a fatal blow to the prosperity of the place. The architecture of Wisby is exceedingly interesting. Its ancient feudal walls and towers exist in almost as entire a state as they were in the 13th. c., and render its appearance, as seen from the sea, exceedingly striking. The early grandeur of the town is attested by the fact that it contains, well preserved, the remains of 18 churches, all of which date from the 11th and 12th centuries, are varied in form and ornament, and are a mine of interest to the student of early Gothic. The oldest is the church of the Holy Ghost, built in 1046. St. Mary's, built in 1190, is the only church now kept up for the use of the inhabitants. Pop. '76, 6,599.

WISCHEHRAD (old Slav. and Bohem. *wyschehrad*, Pol. *wyszogrod*) is the name of numerous towns and castles in all Slavonic countries, e. g., the original residence of the princes of Bohemia, now a quarter of the city of Prague. The word is composed of the root *wys* or *wysch*, high, and *hrad* (Russ. *gorod*, Pol. *grod*, in some dialects *grätz*) a fort, castle, town. *Hrad* is from the same root as Ang.-Sax. *hræd*, Eng. *reed*, *rod*, another form being *yerde* or *yard*. It signified primarily a place defended by rods or poles, a palisaded fort, and hence a town. See *Tox*.

WISCONSIN, a river of Wisconsin, rises in the northern center of the state, and flows s. and w. to join the Mississippi. Length, 270 miles. A canal, completed in 1856, connects with the Fox river; so that there is steamboat communication between lake Michigan and the Mississippi.

WISCONSIN, one of the United States of America, between lat. 42° 31' to 47° n., and long. 87° 8' to 92° 54' w.; 302 m. from n. to s., and 258 from e. to w.; containing 53,924 sq. m., or 34,511,660 acres; is bounded n. by lake Superior and the state of Michigan, e. by lake Michigan, s. by Illinois, and w. by Iowa and Minnesota, from which it is separated by the Mississippi and St. Croix rivers. It is divided into 60 counties. Its chief towns are Milwaukee, Fond du Lac, La Crosse, Oshkosh, Racine, Janesville, Watertown, Madison (the capital), etc. Its chief rivers are the Mississippi and its branches, Rock, Wisconsin, Black, Chippewa, and St. Croix, which drain four-fifths of its surface; the Menominee on the north-eastern border; Wolf and Fox, emptying into Green bay; and numerous small rivers emptying into lakes Michigan and Superior. Besides these great lakes and lake Winnebago, the whole state is studded with small, clear, and beautiful lakes, well stocked with fish. The country is a high rolling prairie, from 600 to 1200 feet above the sea, with no considerable mountains, but numerous hills or mounds. In the rainy season, the rivers Fox and Wisconsin, emptying into the Mississippi and lake Michigan, flow into each other. The geological formations extend only from the primitive to the Devonian. On lake Superior are primitive rocks, granite, magnetic iron, quartz, slates, sandstone, drift, and beds of red clay and marl; sandstone cliffs on the Mississippi; the middle and southern parts of the state have the lower magnesian limestone, a belt of white sandstone with beds of shells, then the lead-bearing group of upper magnesian limestone. Besides the great magnetic iron bed on lake Superior, and the rich lead region bordering on Illinois, copper is found in several places; zinc, some silver, plumbago, bitumen, peat, fine marble (some of light pink with red veins, and blue and dove color), gypsum, and coal in small quantities. Of the curiosities are earthworks in the forms of men and animals; ancient fortifications; Devil's lake of 600 acres, on the summit of a mound 300 feet high; the precipitous shores of lake Pepin rising to 500 ft., 200 ft. being a perpendicular wall of magnesian limestone; the

high bluffs of the Mississippi and Wisconsin rivers; the falls of the St. Louis (320 ft. in 16 m.) and of the Menominee (134 ft. in $1\frac{1}{2}$ m.) The climate is cold, the winters long and severe; but the state is considered one of the most healthy in the west. The soil in the n. is broken, with drift and boulders, covered with heavy pine forests, and not well adapted to cultivation; the middle and southern region, of prairies and park-like oak openings, is exceedingly rich and productive, raising great quantities of wheat, Indian corn, oats, barley, potatoes, tobacco, etc. Besides the great pine forests of the north, there are spruce, cedar, various oaks, hickory, birch, elm, sycamore, sugar-maple, etc. Of animals there remain the elk, deer, bear, foxes, wolves, beaver, gopher, etc.; and numerous birds and water-fowl, fattening upon the wild rice, on the margins of the numerous lakes. The chief manufactures are of iron, lumber, agricultural implements, flour, spirits, and malt liquors. The amount of wheat raised in 1873 was estimated at 26,322,000 bushels. The total valuation of property in 1875 was \$421,285,359. In 1876 there were 2,565 m. of railway, and extensive lake and river navigation. State and government appropriations of land have richly endowed a state university at Madison, normal, high, and common free schools, and the usual state asylums. The constitution and government closely resemble those of the older states. In 1878 the state debt amounted to \$2,252,057; the state receipts in the year ending Sept. 30, 1878, were \$1,120,837. Wisconsin was explored by the French missionaries in the latter part of the 17th c., and Indian trading-posts were also established; but the actual peopling of the state has been recent, and very rapid—a large proportion being of foreign birth—German, Norwegian, Irish, Welsh, etc. It was organized as a territory in 1836, and admitted into the union as a state in 1848. Pop. '40, 30,945; '50, 305,391; '60, 775,873; '70, 1,054,670; '75, 1,236,725.

WISCONSIN (*ante*), for the most part is a great plain, varied only by the cliffs bordering the rivers and lakes, and elevated from 600 ft. to 1500 ft. above the ocean. The highest lands are those along the sources of the tributaries of lake Superior, which, near the Montreal river, are 1700 ft. to 1800 ft. above the sea, gradually diminishing westward to about 1100 ft. at the w. line of the state. From this great water-shed the land slopes rapidly toward the lake, and more gradually toward the s. to the lower Wisconsin river, whence there is another slope toward the s., drained mostly by the waters of Rock river and its tributaries. In the s.w. part of the state are elevations called "mounds" of considerable height. These are Blue mound, in Dane co., which is 1700 ft.; Platte mound, in Grant co., 1281 ft.; and Sinsinawa, also in Grant co., which is 1169 ft. above the sea. The rivers which discharge their waters into lake Superior are the Montreal, Bad river, Bois Brulé, and St. Louis. They are all short, and have a descent of about 800 ft. in a length of 30 or 40 miles. The Menominee, Peshtigo, Oconto, Pensaukee, and Fox or Neenah rivers run into Green bay. The last named is an important stream, rising in Green lake or Columbia co., and flowing so near the Wisconsin river that a short canal connects the two and makes navigation possible between Green bay and the Mississippi. Other rivers are the Kewaunee, Manitowoc, Sheboygan, and Milwaukee, which are tributaries of lake Michigan. The Mississippi, as stated above, forms a part of the western boundary of the state, and receives within the state the St. Croix, Chippewa, Buffalo, Trempealeau, Black, and Wisconsin rivers, as well as several smaller streams. The coast-line is about 120 m. on lake Superior and 200 m. along lake Michigan. The geology of the state is the series of rocks extending from the Laurentian to the Devonian period. In the n. central portion there is a large area of archæan rocks, having an extreme length e. and w. of nearly 240 m., and a breadth n. and s. of 160 miles. These rocks are metamorphic in origin, and consist chiefly of granite, gneiss, syenite, diorite, and other hornblende and allied rocks, quartzite, porphyrite, and a variety of schists and slates. South, s.w., and s.e. of this tract, and again on the lake Superior slope, appears the Silurian period, which prevails over all the rest of the state, several beds of the upper and lower Silurian having been identified as belonging to the well-known New York series of paleozoic groups. In the s.w. the Galena limestone prevails; and in the n. are handsome Laurentian limestones or marbles, blue, red, dove-colored, and variegated. All these rocks are older than those of the coal formations, and consequently no coal is found in the state. Lead ore is the most important mineral product, and this is found chiefly in Grant, Lafayette, and Iowa counties. Iron ores are found in large quantities at Iron ridge in Dodge co., at Ironton in Sauk co., at the Black river falls in Jackson co., and in the Penokee iron range in Ashland co., near lake Superior. Magnetic ores also occur in the archæan region in the vicinity of the Menominee river, in the n.e. part of the state. Native copper is found in limited quantities in the n. part of the state, and copper ores have been discovered in fissures in Iowa and Crawford counties. Two ores of zinc, associated with the lead, have been smelted at Mineral Point. The soil of the greater part of the state is arable and very fertile. Much of the northern portion is covered with forests that furnish many millions of feet of lumber annually. The prevailing trees in this region are the lofty white pine, balsam, hemlock, and other cone-bearing evergreen trees. The southern half of the state is partly prairie, though here and there are islands of timber, or, as they are sometimes called, "oak-openings," the trees being mainly the burr oak. The zoology of the state embraces 62 species of mammals, over 300 birds, 19 species of reptiles, and over 100 mol-

lusk. The elk is occasionally found; and deer, bears, beavers, the fisher, wolf, otter, wild-cat, and porcupine are not uncommon; while the rabbit, squirrel, striped gopher, mole, bat, and field-mouse exist in great numbers. The larger birds are the golden and bald eagles, great white owl, quail, partridge; the spruce, willow, prairie, and sharp-tailed grouse; woodcock, wild goose, ducks, pelican, and loon. The lakes and rivers abound with fish, especially the whitefish, lake-trout, siskewit, muscalonge, perch, pickerel, and sturgeon. The climate of the state is considered, notwithstanding the long and severe winters, healthful. The mean annual temperature of the southern and more settled portion is 46°; mean temperature of winter, 20°; of spring and autumn, 47°; and of summer, 72°. Snow usually falls in the n. before the occurrence of heavy frost, and continues to cover the ground until spring, protecting the roots of plants from freezing, and hastening the growth of vegetation in the spring. The annual quantity of rain and melted snow is about 32 in.; and the barometer varies in its extremes from 28 to a little above 30 in., the mean being about 29.5 inches.

The history of Wisconsin dates from 1639, when the first white settlement within its borders was made at Green bay by the French. During the next forty years several places, among them Prairie du Chien, on the Mississippi, were settled, and war was waged with the Indians to secure the right of way through lake Winnebago. The whole region was under the laws of Canada and subject to the British government until 1796, when it was ceded to the United States and annexed to what was known at that time as the North-west territory, an immense tract of country that had been given up to the confederation, after the revolution, by Virginia and other states of the union. In 1836 it was formed into an independent territory out of lands comprised within the territory of Michigan, and embraced, besides the present state limits, all the land within the states of Iowa and Minnesota, and that part of the present territory of Dakota which lies e. of the Missouri and White Earth rivers. These portions were set off in 1838 and in 1849, the year after Wisconsin became a state, since which time the area has remained unchanged. A constitution was framed by a convention sitting at Madison from October to December, and was approved by congress, but was rejected by the people on account of certain provisions relating to banks. A second convention, therefore, was held during the two following months, and a constitution prepared which was ratified by the people by a vote of 16,442 to 6,149. At the time of admission to the union the population of the state was about 800,000, and it ranked 24th. Since the civil war of 1861-65, in which it bore a conspicuous part in support of the union, the population has gained in numbers rapidly, and the wealth and various industries of the state have increased greatly. At present it ranks 14th. By the census of 1880 the total population of the state was reported to be 1,315,480, a gain of 264,129 in ten years. There were 680,106 males and 635,374 females; those of native birth numbered 910,063, and those of foreign birth, 405,417. The city of Milwaukee had 115,578 inhabitants; Oshkosh, 15,749; La Crosse, 14,505; and Fond du Lac, 13,091.

In agricultural products the state ranks among the first in the union. According to the census of 1870 there were at that date 11,715,321 acres in farms, of which about one-half was improved land. The cash value of the land was estimated to be \$300,414,000, and of farming implements and machinery, \$14,239,364. The total estimated value of farm productions, including betterments and additions to stock, was \$78,027,032; value of orchard products, \$819,268; of produce of market gardens, \$226,665; of forest products, \$1,327,618; of animals slaughtered or sold for slaughter, \$11,914,643; of all live stock, \$45,310,882. The live stock included 252,019 horses, 4,195 mules, 308,377 milch cows, 53,615 working oxen, 331,302 other cattle, 1,069,282 sheep, and 512,778 swine. By the returns of the state assessors in 1875 (five counties not reported) there were planted during that year 1,539,008 acres of wheat, 766,343 of oats, 866,681 of Indian corn, 117,020 of barley, 97,286 of rye, 9,720 of hops, 4,399 of tobacco, and 6,224 of flax. In manufactures the state has made good progress. During the past twenty years a large number of busy manufacturing towns have come into active existence here and there, and the manufactures of lumber, laths, shingles, staves, furniture, agricultural implements, wagons, carriages, and wooden-ware of every kind are leading industries, the scantily-timbered states south-westward affording a convenient market for all such goods. Leather, shoes, saddlery, woolen goods, metallic wares, gloves, lime, cement, and bricks are also important articles of manufacture. Altogether in 1870 there were 7,013 manufacturing establishments, having an aggregate capital amounting to \$41,981,872, employing 43,910 hands, paying \$13,575,642 a year in wages, using raw material valued at \$45,851,266, and producing goods valued at \$77,214,326. The mines and quarries in 1870 numbered 80, in which 701 men and boys were employed, and \$737,728 were invested. The products were valued at \$510,982, including iron worth \$22,000; lead, \$369,067; peat, \$750; stone, \$106,925; and zinc, \$12,240. The foreign commerce of the state is not very extensive comparatively, Milwaukee being the only port of entry; but the coastwise and river commerce is large, and is conducted for the lakes from Milwaukee, Sheboygan, Fond du Lac, and Superior City, and for the Mississippi river from La Crosse and Prairie du Chien, while steamers also ascend the Wisconsin, Chippewa, Fox, and other rivers. The total amount of imports from foreign countries in the year ending June 30, 1875, was \$56,646; and the amount of domestic exports was \$1,390,179. The coastwise trade reported the entry of 7,230 vessels, of 2,872,493 tons burden, and

the clearance of 7,261 vessels, with a burden of 2,798,280 tons. The inter-state commerce by means of railroads is also extensive. In 1876 there were 2,565 miles of road within the state; and the railroads lying wholly or partly in its limits were the Chicago and North-western, Chicago and Milwaukee, North western Union, La Crosse, Trempealeau and Prescott, Chicago, Milwaukee and St. Paul, Wisconsin Union, Madison and Portage, Oshkosh and Mississippi, Galena and Southern Wisconsin, Green Bay and Minnesota, Milwaukee, Lake Shore and Western, Mineral Point, Sheboygan and Fond-du-Lac, Superior and St. Croix, Western Union, West Wisconsin, Chippewa Falls and Western, North Wisconsin, Wisconsin Central, Milwaukee and Northern, and the Wisconsin Valley. The number of national banks in operation at the close of 1875 was 42, having a paid-in capital of \$3,550,000, and an outstanding circulation of \$2,914,329. There were also 23 state banks, which had an aggregate capital of \$1,113,231, loans and deposits amounting to \$6,909,214, and liabilities amounting to \$1,977,742. The mutual fire and marine insurance companies numbered 7, and had \$879,945 paid-up capital and \$1,716,656 net assets.

The total valuation of property in the state in 1879, as determined by the state board of assessments, was \$406,303,185, including personal property valued at \$88,127,940, city and village lots at \$85,545,746.50, and other real estate at \$232,629,498.50. The indebtedness consisted of outstanding war bonds amounting to \$11,000; certificates of indebtedness to trust funds, \$2,241,000; and currency certificates amounting to \$57. In all, \$2,252,057. The receipts into the state treasury during the fiscal year ending Sept. 30, 1879, from all sources were \$1,812,682; the balance on hand Sept. 30, 1878, was \$403,288; making the total receipts \$2,215,971. The disbursements during the same period for all purposes were \$1,627,146; leaving a balance on hand of \$588,824. The receipts into the general fund during the fiscal year were \$1,249,338; balance from previous year, \$79,055—total, \$1,328,394. Of this sum there were derived from direct state tax, \$682,388; railroad companies, license-taxes, \$395,886; insurance companies, fees, and license taxes, \$45,774; miscellaneous sources, \$125,289. The disbursements from this fund were: interest on public debt, \$157,560; school fund, \$7,088.36; high schools, \$25,000; state university, \$41,310.30; salaries and other permanent appropriations, \$109,023.62; legislative expenses, \$84,301.61; benevolent and penal institutions, \$378,815.72; miscellaneous purposes, \$252,012.90.

The general management of the public schools is vested in a state superintendent, 64 county superintendents, 27 city superintendents, and a school-board in each district. In each independent city there is a board of education, and the larger cities have each a superintendent. The school-fund, created by the constitution in 1848, comprises the income from the proceeds of lands granted by the United States to the state for educational purposes, all moneys accruing from forfeiture or escheat, all fines collected in the several counties for breach of the penal laws, all moneys paid for exemption from military duty, and five per cent on the sale of government lands. During the year ending Sept. 30, 1875, the income of the school-fund amounted to \$186,409, and the disbursements, \$185,961. The total number of children in the state, over 4 and under 20 years of age, in 1875 was 461,829, of whom 279,854 received instruction in the public schools, 10,733 in private schools, 2,150 in colleges and academies, and 1150 in benevolent institutions. There were 5,489 school districts and 5,197 school-houses; 9,455 teachers; and the total amount expended for schools was \$2,065,370, including \$1,350,784 for teachers' wages. In the larger towns are high and graded schools, and state normal schools are maintained at Whitewater, Platteville, Faver Falls, and Oshkosh. The colleges and universities of the state are Beloit college (Congregational and Presbyterian), at Beloit; Galesville university (Methodist Episcopal), at Galesville; Lawrence university (Methodist Episcopal), at Appleton; Milton college (Seventh-day Baptist), at Milton; North-western university (Lutheran), at Watertown; Pio Nono college and normal school (Roman Catholic), at St. Francis station; Racine college (Episcopal), at Racine; Ripon college (Congregational), at Ripon; St. John's college (Roman Catholic), at Prairie du Chien; and the university of Wisconsin (state), at Madison. The principal academies and seminaries are Carroll college, at Waukesha; Elroy seminary, at Elroy; Rochester seminary, at Rochester; and St. Clair academy, at Sinsinawa Mound. The libraries in the state in 1870 numbered 2,883, and had 905,811 volumes. There were 4 state libraries, with 61,400 volumes; 9 town and city, with 4,838 volumes; 8 court and law, with 1010 volumes; 194 school and college libraries, having 50,492 volumes; and 39 circulating libraries, with 38,867 volumes. The number of newspapers and periodicals published is about 255, of which 21 are dailies, 200 weeklies, and 50 monthlies. The number of church organizations in 1875 was 2,388; of church edifices, 1853; and the total value of church property was estimated to be \$6,905,350. Of the different denominations represented, 272 were Baptist, 18 Christian Connection and Disciples, 211 Congregational, 78 Protestant Episcopal, 107 Evangelical associations, 3 Friends, 5 Jews, 222 Lutherans, 618 Methodists, 15 Moravians, 5 Swedenborgian, 128 Presbyterian, 20 Dutch Reformed church, 25 German Reformed church, 455 Catholic, 9 Second Advent, 8 Unitarians, 69 United Brethren in Christ, 18 Universalist, and 1 Union.

The constitution of the state grants the right of suffrage, with the usual exceptions, to every male citizen 21 years of age, and also to all persons who have declared their intention to become citizens, and who have resided in the state one year. The executive

power is vested in a governor, lieutenant-governor, secretary of the state, attorney-general, etc., who are elected by the people every two years. The legislature consists of a senate, with 33 members, chosen every two years, and an assembly, of 100 members, elected annually. The judicial authority is vested in a supreme court, circuit courts, courts of probate, and justices of the peace. The supreme court consists of one chief-justice and two associate justices, and has appellate jurisdiction only, and general power of review of all action of the inferior courts, and in no case that comes before it is a jury called. There are 12 judicial districts, in each of which a circuit judge is chosen by the electors of the district for six years. These have general original jurisdiction in civil and criminal cases, and appellate jurisdiction over all inferior courts. They are held twice a year in each county. United States courts are held at Milwaukee and Madison semi-annually, and at Oshkosh and La Crosse annually. The state is entitled, under the apportionment of 1872, to 8 members of congress, and 10 votes in the electoral college. The electoral votes, since the state's admission to the union, have been cast as follows: 1848, Cass and Butler, 4; 1852, Pierce and King, 5; 1856, Fremont and Dayton, 5; 1860, Lincoln and Hamlin, 5; 1864, Lincoln and Johnson, 8; 1868, Grant and Colfax, 8; 1872, Grant and Wilson, 10; 1876, Hayes and Wheeler, 10; 1880, Garfield and Arthur, 10.

WISCONSIN, UNIVERSITY OF, at Madison, the capital of the state; organized 1849; reorganized, 1866. It is a state institution, unconnected with any religious denomination, and open upon equal terms to students of both sexes. Its object is to provide the means of acquiring a thorough knowledge of the various branches of learning connected with scientific, industrial, and professional pursuits. It consists—1, of the college of arts; 2, the college of letters; 3, such professional and other colleges as may from time to time be added. The college of arts embraces a general science course, and the special technical departments of agriculture, civil engineering, mining engineering and metallurgy, and mechanical engineering. The college of letters embraces the ancient classical course and the modern classical course. The university has funds amounting to \$483,000, and an annual income of over \$80,000. Its buildings and grounds (the latter embracing a tract of 210 acres) are valued at \$325,000. The library contains about 10,000 vols. The university is provided with extensive and valuable geological and mineralogical cabinets and collections in natural history; also, with well-selected philosophical and chemical apparatus. There are also chemical, zoological, physical, mineralogical, and assay laboratories. The machine-shop, amply provided, gives opportunities for work in practical mechanics. The astronomical observatory is in use, and will be completely furnished as rapidly as possible. Ladies' hall is an elegant and commodious building, containing a society hall, teachers' room, study and lodging rooms for about 80 students, and ample accommodation for boarding. Military drill is required each day during the spring term, of the young men of the freshman and sophomore classes. A well-furnished gymnasium and two bowling alleys are open to the students at fixed hours. The university is situated on the shores of lake Mendota, and the students can find relaxation and exercise in boating. Professors (1879-80), 24; other instructors, 13; students, 481. John Bascom, D.D., LL.D., is president.

WISDOM, BOOK OF, found in the Apocrypha under the title *Wisdom of Solomon*, contains three parts: The *first*, chapters i.-v. commends wisdom, consisting in righteousness, as requisite for rulers in order that they may escape the judgment of God and be delivered from death. God created men to be immortal, while death is the devil's work, and they that side with him will bring it on themselves. The *second*, vi.-ix. teaches that wisdom may be acquired by those who love it and practice righteousness. "Wisdom is glorious and never fadeth away; yea, she is easily seen of them that love her, and found of such as seek her. He that seeketh her early shall find her sitting at his doors." The *third*, x.-xix. gives historical illustrations of the effects of both wisdom and folly in the lives of Adam, Cain, Noah, Abraham, Lot, Jacob, Joseph, the Egyptians, the Israelites, idolaters, and the makers of idols.

WISE, a co. in n. Texas, drained by the West fork and Denton fork of the Trinity river; 850 sq.m.; pop. '80, 16,605—16,392 of American birth, 165 colored. Co. seat, Decatur.

WISE, a co. in s.w. Virginia, having the Cumberland mountains on the n.w. separating it from Kentucky, bounded on the s.e. by Clinch river, drained by Russell's fork of Sandy river; 450 sq.m.; pop. '80, 7,772—7,769 of American birth, 101 colored. Co. seat, Wise Court-House.

WISE, HENRY ALEXANDER, American statesman, was b. at Drummondtown, Accomac co., Va., Dec. 3, 1806; graduated at Washington college, Pennsylvania, in 1825; studied law at Winchester; settled and married at Nashville, Tenn., but two years after returned to his native county, and engaged in politics; in 1825, advocated the nomination of gen. Jackson at the Baltimore convention; opposed nullification, but maintained the state-rights doctrines of Jefferson and Madison as expressed in the Virginia resolutions of 1798, that "each state for itself is the judge of the infraction of the constitution, and of the mode and manner of redress." Elected to congress in 1833, he was involved in a duel with his opponent, whose arm he fractured. On the removal of the government deposits by gen. Jackson, he went over to the opposition or whig party,

but was sustained by his constituents, over whom he had an unbounded personal influence. In 1837 he was the second of Mr. Graves, a member of congress from Kentucky, who shot Mr. Cilley, a member from Maine, in a duel. In 1840 he secured the nomination of John Tyler as vice president; and on Tyler becoming president by the death of gen. Harrison, had a powerful influence in his administration. Nominated minister to France, he was rejected by the senate, but confirmed for Brazil, where he resided until 1847. He was now once more identified with the democratic party; and in 1854, after an arduous electioneering campaign, in which, though in feeble health, he traveled 3,000 m., and made 50 stump speeches against the "know-nothing" or Protestant native American party, he was elected governor of Virginia. In 1859 he published a treatise on territorial government, maintaining the right of congress over the institution of slavery. In December of this year, he signed the death-warrant of John Brown, hanged for treason in attempting to excite a negro insurrection. In 1861 as member of the Virginia convention, he labored for conciliation; but when his state voted for secession, he entered heartily into the war, and was appointed brig. gen., serving in the Kanawha valley, and later, defending Roanoke island, where his son was killed. He died at Richmond in Sept., 1876.

WISE, HENRY AUGUSTUS, 1819-69; b. N. Y.; son of George Stuart, a naval officer. He was appointed a midshipman when but 14 years old, and served in the Florida squadron during the Seminole war, and as lieut. in the Mexican war. He became commander in 1862, and assistant chief in the bureau of ordnance and hydrography; promoted capt., 1867. He wrote *Los Gringos* (1849); *Tales for the Marines* (1855); and other sea-stories.

WISE, JOHN, 2652-1725; b. Mass.; graduated at Harvard, 1673; began to preach at Ipswich, 1680; was fined, imprisoned, and deposed from the ministry by gov. Andros for remonstrating against illegal taxation; sued chief-justice Dudley for disregard of the habeas corpus act; sent to the legislature, 1689, after the downfall of Andros; chaplain of the expedition against Quebec, 1690; opposed the scheme for subjecting the churches of Massachusetts to ecclesiastical councils, and advocated inoculation for small-pox, 1721. His two books on church government have been republished by the Congregational board.

WISEMAN, NICHOLAS, Cardinal, and Roman Catholic archbishop of Westminster, was b. Aug. 2, 1802, at Seville, of an Irish family settled in Spain. He was brought to Ireland in his childhood, and received his first education at Waterford, whence he was removed to the Roman Catholic college of St. Cuthbert at Ushaw, near Durham. In his 16th year, he entered as an ecclesiastical student the English college at Rome, and after a very brilliant course, received holy orders at Rome in 1823, at which time he was also admitted to the degree of doctor of divinity, and was appointed vice-rector of the English college, and professor of oriental languages in the university of the Sapienza. In 1828 he published his *Hore Syriacæ*, and in the end of that year was named rector of the English college. It was while he held this office that he delivered his *Lectures on the Connection of Science and Revealed Religion* (2 vols. 8 vo, 1836). But in England he first became known by a series of lectures on *The Doctrines of the Catholic Church*, delivered at Moorfields church, and published in two vols. in 1836. In the same year he established, in concert with Mr. O'Connell, the *Dublin Review*, a journal which has since continued to be the quarterly organ of the Roman Catholic body, and to which Dr. Wiseman, even while residing abroad, was a regular contributor. In 1840 he was named coadjutor vicar-apostolic of the central district of England, with the title of bishop of Melipotamus *in partibus infidelium* (q.v.). At the same time he was appointed president of St. Mary's college of Oscott, where he took up his residence. The circumstances of religious parties in England at this period contributed much to bring Dr. Wiseman's very remarkable abilities as a polemical writer into prominence; and the dissensions which arose in the church of England during the Tractarian controversy, were turned to effect by him in various lectures, pamphlets, reviews, essays, etc. In 1846 he was transferred as coadjutor vicar-apostolic to the London district; and in 1849 became himself acting vicar. In the following year, he came still more remarkably into notice, during the progress of a change in the position of the Roman church in England, which, for a time, was the occasion of almost unexampled religious excitement in the country. From the reign of Elizabeth, the sees in England having been occupied by bishops of the established church, and it being penal for a bishop or priest of the Roman Catholic church to officiate in England, the Catholics, for the necessary religious ministrations of their church, had resorted to the well-known expedient of a system of bishops *in partibus infidelium* (q.v.), with the title and authority of vicars apostolic (q.v.). This form of church government, with some modification, had in substance subsisted from the time of James I.; but from the date of the passing of the Catholic emancipation act, a desire had gradually sprung up among Catholics for the restoration of the normal form of church government by the appointment of regular bishops. This measure was finally determined on by the pope in the year 1850, and a new distribution of the kingdom was made into 12 sees (one of them archiepiscopal), in which, in order that it might not be supposed to clash with the existing episcopal system, the names of the ancient sees were carefully avoided, the titles of the new bishops being taken exclusively from cities and towns which were non-episcopal. Dr. Wiseman was named archbishop of the see of

Westminster, which included great part of the district already under his charge, and was at the same time created cardinal. This measure, for which the Protestant public were but little prepared, and which was made more formidable in their eyes by the language which was employed, although but following the established canonical forms, and bearing altogether on the spiritual concerns of the Catholics, was supposed to involve an invasion of the rights and dignities of the established church and of the crown, and called forth a storm of religious excitement which was unexampled during the memory of the living generation. While this excitement, which was much influenced by a letter addressed by the prime minister to the bishop of Durham, was at its height, the new cardinal, who had gone to Rome to receive the cardinal's hat, returned to England, and published an explanatory address of great ability and moderation, but yet firmly asserting the strictly constitutional rights of his fellow-Catholics, entitled *An Appeal to the Reason and Good Feeling of the people of England on the Subject of the Catholic Hierarchy*. This address, as well as certain lectures subsequently delivered by him, and extensively circulated, did much to mitigate the excitement, which nevertheless led to violent debates in parliament, and to the passing of an act prohibiting the use of ecclesiastical titles other than those recognized by the law. See ECCLESIASTICAL TITLES ASSUMPTION ACT. Notwithstanding these unfavorable circumstances of his introduction into notice in England, however, the undoubted abilities and great literary eminence of cardinal Wiseman eventually compelled the admiration of the British public. He took frequent occasion, moreover, by public lectures and addresses on the neutral subjects of education, literature, and art, to identify himself with the spirit of progress, and with the national sentiments of his fellow-countrymen; and notwithstanding the infirmity of his constitution, which began to fail soon after his return to England as cardinal, he published during these years a succession of works which although with the strong religious bias natural to a Roman Catholic churchman of earnest convictions, possessed much, nevertheless, congenial to the sympathies of cultivated Englishmen of every degree. The *Lectures on Religion and Science* already referred to; *On the Connection between the Arts of Design and those of Production*; on the *Influence of Words on Thought and Civilization*; on the *Points of Contact between Science and Art*; *Recollections of the Last Four Popes*, and other similar works, obtained an extensive circulation; and partly from their effect upon the public mind, partly, no doubt, from the reaction consequent on what was soon felt to have been a groundless and exaggerated alarm, cardinal Wiseman came by degrees to command the respect of the public at large. He died in his 63d year, on Feb. 15, 1865; and his funeral, which was conducted with great solemnity, and excited great public curiosity and interest, was witnessed with every demonstration of respect by one of the largest assemblies seen for many years in London. Besides admittedly high professional learning, he was a scholar of rare and singularly various attainments, an eminent linguist, a well-informed scientific scholar, a distinguished orator, a graceful and vigorous writer, and an accomplished critic and connoisseur of art. In addition to the works incidentally mentioned above, he published *The Real Presence of the Body and Blood of Our Lord Jesus Christ in the Eucharist* (8vo, 1836); *Reply to Dr. Turtton on the Eucharist* (8vo, 1839); *Lectures on the Ceremonies of Holy Week* (8vo, 1839); *Essays on Various Subjects* (3 vols., 8vo, 1853)—a selection of articles contributed to the *Dublin Review* and other periodicals, and of other fugitive essays; *Fabiola, or a Church of the Catacombs*; a singularly truthful and life-like picture of early Christian life in classic Rome; *Sermons* (2 vol., 8vo, 1864); with many shorter publications. He also left a large collection of MSS., many of them prepared for the press. In 1866 appeared *The Witch of Rosenburg, a Drama in Three Acts*; and *Daily Meditations* in 1868.

WISHART, GEORGE, one of the early reformers of Scotland, is supposed to have been a native of Forfarshire, a son of James Wishart of Pittarow, justice clerk in the reign of James V. The exact date of his birth is unknown. He first emerges into notice in the beginning of the 16th century. At this time he taught a grammar school at Montrose, and made himself remarkable by introducing the study of Greek. He began also to preach the doctrines of the reformation, and was obliged to flee into England. Here he is found at Bristol about 1538, preaching the same doctrines, but being seized upon and threatened with death, he publicly recanted. Later he is found at Cambridge, in the center of the Anglican reform movement, which had begun there under the influence of Bilney and Latimer. He is described at this time by a pupil of the name of Tylney as a "tall man polde-headed, of melancholy complexion, black-haired, long-bearded, comely of personage, well spoken after his country of Scotland, courteous, lowly, lovely, glad to teach, desirous to learn, abstinent in his habits, and very charitable to the poor." His portrait, which has been preserved in the university of Glasgow, answers to the personal characteristics here mentioned. He returned to Scotland in 1543 or 1544, with the commissioners sent to negotiate a treaty with Henry VIII., and it was then that he entered upon his special reforming mission, terminating in his martyrdom. He appears to have possessed great powers as a preacher, although it is doubtful whether he ever took orders; and he traveled from town to town, and county to county, making everywhere a great impression by his stirring words. Knox has given in his *History*, book i., a very striking description of the effects of Wishart's preaching. Its effect upon himself was the most

important and fruitful of all. When the preacher came to Lothian, Knox, charmed by his character and teaching, attached himself to his person, bearing a "two-handed sword" before him. This precautionary defense was rendered necessary by two attempts supposed to have been instigated by Beaton against his life. His activity and influence were too prominent long to escape notice. Cardinal Beaton had had his eye upon him for some time, and while he rested at Ormiston, after preaching a powerful sermon at Haddington, he was made a prisoner by the earl of Bothwell. Beaton himself was in the neighborhood with a considerable force, in case it should have been attempted to rescue him. He was conveyed to St. Andrews, and immediately put upon his trial before an ecclesiastical tribunal. Arran, the governor, refused to give him countenance to the proceedings; but the reforming preacher was nevertheless condemned to be burned at the stake; and the sentence was carried out before the castle or episcopal residence at St. Andrews on Mar. 1, 1546.

Wishart is reported to have given utterance at the stake to a prophecy of the death of the cardinal, which took place about three months after his martyrdom. "But he who from yonder high place beholdeth us with such pride shall, within a few days, be in the same as ignominiously as now he is seen proudly to rest himself," are the words attributed to him. This has appeared to some recent writers to strengthen the suspicion, otherwise suggested, of Wishart having been accessory to the plot for assassinating the cardinal. The main ground of this suspicion is the discovery of a document in the state paper office, bearing that "a Scottishman called Wysshart," a friend of the laird of Brunstone, was concerned in this plot. Mr. Tytler confidently adopted the view that this friend of the laird of Brunstone and the reformer were the same person, and it cannot be denied that there are reasons in favor of this inference, not in the mere coincidence of the name, perhaps, but in the fact of the association of the person bearing it with the laird of Brunstone, who was a familiar friend of Wishart; and further, in the fact, that Kirkaldy of Grange and the master of Rothes, who are mentioned in the document as conspiring either to "apprehend or slay the cardinal," were afterward really his murderers. At the same time, it cannot be said that there is decisive evidence to prove that the "Wysshart" of the state document was George Wishart, the reformer and the martyr. The coincidences might be accidental, and the question will probably remain among the *questiones vexate* of Scottish history.

WISHAW, a thriving t. of Scotland, in Lanarkshire, 15 m. s.e. of Glasgow, has made great advances within the last thirty years. The staple trade of the district is coal, of which upward of 1,000,000 tons are sent from Wishaw annually. There are also numerous iron works, etc. Pop., with Cambusnethan, '71, 10,607.

WISMAR, the second sea-port of Mecklenburg-Schwerin, at the head of a bay of the same name, an inlet of the Baltic. Its harbor is the best on the Baltic coasts, and is furnished with ship-building docks. Its old fortifications have been removed; but many of its old buildings, which are exceedingly curious and picturesque, remain. Commerce, the fisheries, tobacco, and sail-cloth manufactures, and agriculture are the principal employments of the inhabitants; there are also breweries and distilleries. Wismar is the terminus of a branch of the Mecklenburg railway, and communication by steamers subsists between it and Copenhagen. Pop. '75, 14,462.

WISNER, BENJAMIN BLYDENBURG, D.D., 1794-1835; b. N.Y.; graduated with honors at Union college, 1813; had charge of Johnstown academy, 1813-14; tutor at Union college, 1815-18, during which time studied theology; graduated at Princeton seminary, 1820; pastor of old South church, Boston, 1821-32; one of the secretaries of the A. B. C. F. M., 1832-35, and as such was highly efficient and successful, visiting many Congregational and Presbyterian churches, forming missionary associations and awakening great zeal for the cause. He was also an active member of several other benevolent societies, and was author of a history of the old South church.

WISSEMBOURG (German *Weissenburg*), till 1871 a French fortified t., now capital of a district in the German province of Lower Alsace, is on the Lauter, 34 m. n.e. of Strasburg. It has a flourishing trade, and a pop. of (1875) 6,157. Here was fought, Aug. 4, 1870, the first great battle of the Franco-German war. Besides the fortifications of Wissembourg, demolished in 1872, the lines of Wissembourg are famous—a line of works extending to Lanterburg, 9 m. south-east.

WISTAR, ANNIS LEE (FURNES), b. Philadelphia, 1840; daughter of the rev. Dr. W. H. Furness, and wife of Dr. Caspar Wistar. She has published several translations from the German of Marlitt, Wilhelmine von Hillern, Huckländer, and others.

WISTAR, CASPAR, 1761-1818; b. Philadelphia; received a medical degree from the university of Edinburgh in 1786. He was professor of chemistry and physiology in the Philadelphia medical school, 1789-92, when he was appointed adjunct professor of anatomy and surgery. In 1808 he became full professor in those departments, and held that position till his death. He published, among other works, *A System of Anatomy*.

WISTA RIA, a genus of plants of the natural order *leguminosæ*, sub-order *papilionaceæ*, having pinnate leaves and flowers in terminal racemes, the pod leathery. The species were formerly included in the genus *glycine*. Some of them are among the most magnificent ornamental climbers known in British gardens. *W. frutescens*, a

native of Virginia, Illinois, and other parts of North America of similar climate, found chiefly in marshy grounds, attains the length of 30 ft., and has beautiful racemes of fragrant bluish purple flowers. *W. Chinensis* or *consequina*, a native of China, has larger flowers in pendulous racemes, and its branches run to the length even of 90 feet. In Britain these plants are generally trained on walls.

WITCH-CRAFT * is merely the form that the belief in the arts of magic assumed under the action of certain notions introduced by Christianity. The powers supposed to be possessed by the witches, and the rites and incantations by which they acquired those powers, were substantially the same as belonged to the devotees of the Greek Hecate (q.v.), the Striga and Venefica of the ancient Romans, and the Vala or wise woman of the Teutonic pagans. But when, along with the knowledge of the one true God, the idea of a purely wicked spirit, the enemy of God and man, was introduced, it was natural that all supernatural powers not proceeding directly from the true God, should be ascribed to him. This gave an entirely new aspect to such arts: they became associated with heresy; those who practiced them must be in compact with the devil, and have renounced God and the true faith. Previously, if a witch was punished, it was because she had been guilty of poisoning, or at least was believed to have poisoned or wrought some other actual mischief. Now, however, such power was only the power to work evil; and merely to be a witch was in itself a sin and crime that filled the pious mind with horror. This feeling, zealously fostered, first by the Catholic clergy, and then no less by the Protestant, rose to a frenzy that for four centuries filled Europe with the most shocking bloodshed and cruelty.

Almost all the various notions and practices noticed under the heads MAGIC, DIVINATION, INCANTATION, AUGURIES, CHARM, TALISMAN, ORDEAL, FETTERISM, EVIL EYE, etc., are embodied more or less prominently in the huge mass of superstitions which formed the creed of witchcraft in its full development. A reference, therefore, to those heads, and to the kindred subjects of ASTROLOGY and ALCHEMY, saves the necessity of entering into descriptive details of what witchcraft was. What was new and distinctive in the witchcraft of Christendom was the *theory* of magical arts which it involved. The doctrine of the devil (q.v.), as finally elaborated in the middle ages, established in the world a rival dominion to that of the Almighty. The arch-fiend and his legions of subordinate demons (q.v.) exercised a sway, merely permitted, no doubt, but still vast and indefinite, not only over the elements of nature, but over the minds and bodies of men—all except those who had been admitted by baptism into the number of the "redeemed" (see ATONEMENT), and continued to be guarded by the faith and rites of the church. The faithful could not be led into evil against their will, nor essentially injured in person; but not even they were altogether exempt from diabolic annoyance, for the immunity does not seem to have extended to their belongings. As a strictly logical consequence of this assumed constitution of things, it followed, that those mortals who had the gifts of producing supernatural effects of any kind (and that such gifts had been possessed by individuals in all ages and countries, was not for a moment questioned), must derive their power from the prince of darkness and be acting as his agents—always excepting, of course, those miraculous powers which the church herself claimed to exercise in the name of heaven. Moreover, as the universally coveted powers of fortune-telling, and of controlling the elements for your own benefit or the hurt of your enemies, could not be supposed to be bestowed by a being of the devil's character except as a *quid pro quo*, and as the object dearest to the devil's heart—the very aim and end, in fact, of his struggle with the kingdom of light—was to win back as many as possible of the souls that had been redeemed from his dominion by the death of Christ, it was natural to conclude that the price he would demand for his gifts would be a renuncia-

* Not a little light is thrown on the original conception of witchcraft, and the magic arts in general, by observing the primary meaning of the various terms employed in connection with them. The most striking thing is the number of those terms that come from roots signifying simply to do, perform. From this notion the transition is easy to a variety of shades of meaning, as is seen in Lat. *factus*, which radically signifies a deed (from *facere*, to do), but became restricted to a bad deed, a crime. The Greek *ποιέω* or *εργάζομαι* (= Eng. work), and the Lat. *facere, operari*, were used, without any addition, to signify to perform sacrifice or other sacred or magical rite. Accordingly, in Low Lat., *factura* signified sorcery; and in modern Ital. *fattura* = incantation, and *fattuchiera* = a sorceress or witch. Lat. *factum* becomes in Span. *hecho*, and means a crime; while *hechicero* is a sorcerer, and *hechiera*, a witch. The Portuguese *feticão*, magic, is also from Lat. *factum*; and Sans. *kratu*, a sacrifice, is from *kri* (= Lat. *creare*), to make.

The Eng. *witch* is *wicce* in Ang.-Sax., which has also *wiccan*, to fascinate, and *wicca-craft*, the art of magic; the Low Ger. dialects have similar forms (e.g., Dutch *wikkerij* = witchcraft; in High Ger. there are no cognate names. These words, as is seen in the Dutch form, have clearly no connection with *witan* (Ger. *wissen*), to know, which is usually given as the root of the English *witch*; and the most probable etymology is that proposed by J. Grimm, who derives them from the Gothic *veihan* (O. H. Ger. *weihan*, modern Ger. *veihen*), which signified to consecrate, but which he infers to have meant primarily to do, make, perform (see *Deutsche Myth.*, pp. 36, 58, 408; *Deutsche Gram.*, iii. 181). *Wühl*, or *wicht*, is evidently a derivative from this root, and signified a thing made (Lat. *factum*), a creature, a person, and, in some Teutonic dialects, a demon. A *wicca* was thus a doer of sacred or magic rites (compare the "I'll do, I'll do, I'll do" of Shakespeare's witches). Wicked is a participle from the same root, and signified primarily bewitched, accursed, hence perverse. Wizard is probably a masculine form of *wicca*.

Nearly corresponding to English *witch* were the Lat. terms *saga*, a knowing or wise woman; *strix*, striga, a kind of nocturnal bird, hence a witch; *venefica*, literally, a poison-maker, a concocter of drugs. The Ger. *hexe*, old Dutch *hagetise*, Ang.-Sax. *hægtesse*, or *hægesse* (from which Eng. *hag*), appear to come from *hag*, cognate with Lat. *sagus*. In O. Norse *hagr* signifies dexterous, cunning.

tion of Christianity and entrance into his service. Hence it came to be the established belief, that in order to acquire the powers of witchcraft, the person must formally sell his or her soul to the devil. The idea of a covenant with the arch-enemy was not involved in the early and heathen conception of magic. Originally magic was identical with the lowest form of religion, that is, Fetichism (q.v.). It was grounded on the idea that certain natural objects and certain rites and observances had, in themselves, a mysterious power of producing wonderful effects; and the art of the magician consisted in the knowledge of these mysterious powers, and in the skill to combine and direct them to special purposes. The effects were not conceived as being produced by the interference of any conscious being—god or devil. On the contrary, a human being could, through magical means, acquire control over supernatural beings. The Hindus carry this notion so far, that they represent some of their sages as practicing austerities and performing sacrifices and other rites, until they can control the gods themselves, and even threaten their destruction along with that of the universe (see *Viśvāmitra*). The higher kind of European magic in the middle ages, was mixed up with what physical science there then was; and the most noted men of the time were addicted to the pursuit, or were at least reputed to be so. So far from deriving their power from the kingdom of darkness, the scientific magician, by the mere force of his art, could compel the occasional services of the arch-fiend himself, and make inferior demons the involuntary slaves of his will. A belief, however, had early existed that individuals in desperate circumstances had been tempted to purchase, at the price of their souls, the help of the devil to extricate them from their difficulties (see *Theophrastus*); and hence a suspicion began to grow that many magicians, instead of seeking to acquire their power by the laborious studies of the regular art, had acquired it in this illegitimate way. At last, as the system of dualism above mentioned became more perfect, the art of magic was wholly diabolized, and a compact with the evil one was thought to be the sole charter of supernatural power. See *FAEST*. This transformation took place earlier and more completely (about the 13th c.) in regard to those lower forms of the magical art which constitute witchcraft proper, and which have from ancient times been considered the special province of women. The chief cause of the prominent part assigned to the female sex in this matter is noticed in the article *MAGIC*. In addition, it may be observed, that their more excitable temperament renders them peculiarly liable to those ecstasies (q.v.) which have been associated with the gift of divination from the priestesses of the ancient heathen oracle down to the medium of modern spiritualism. Further, when witchcraft came to be prosecuted as heresy, the part assigned to woman in the Scripture account of the fall led to her being looked upon as specially suited to be the tool of the devil. Founded on this circumstance, a constant element of the creed of witchcraft came to be the belief in a carnal intercourse between witches and evil spirits. The devil was supposed to tempt them in the shape of a wooer, and the unholy compact was consummated in carnal fashion.

The bargain was usually in writing, signed with the witch's own blood. She was rebaptized, receiving a new name, and had to trample on the cross and renounce God and Christ (among Roman Catholics, also the Virgin Mary), in forms parodying the renunciation of the devil in the formula of Christian baptism. A mark was impressed on some part of her body; this mark remained forever after insensible, and was one of the means of discovery employed by the witch-finders. The powers conferred by Satan on these covenanted servants of his were essentially the same as had always been attributed to sorcerers; the mode of exorcising them was also the same, namely, by charms, incantations, concoctions, etc. The only change was in the theory. These mystic rites, instead of producing their effects by an inherent virtue, were merely symbols by which the witch conveyed her behests to the devil and his ministers, who obeyed them according to the compact. Another difference to be noted is, that the power was exclusively directed to work evil—to raise storms, blast crops, render men and beasts barren, inflict racking pain on an enemy, or make him pine away in sickness (which was usually done by making an image of wax, and sticking it full of pins, or setting it to melt away before the fire). If a witch attempted to do good, the devil was enraged, and chastised her. A remarkable circumstance is, that witches seem to have been powerless to serve their own interests, for they remained poor and miserable.

A prominent point in witchcraft was the belief in stated meetings of witches and devils by night, called *witches' Sabbaths*. First anointing her feet and shoulders with a salve made of the fat of murdered and unbaptized children, the witch mounted a broomstick, distaff, rake, or the like, and, making her exit by the chimney, rode through the air to the place of rendezvous. If her own particular demon-lover came to fetch her, he sat on the staff before, and she behind him; or he came in the shape of a goat, and carried her off on his back. At the place of assembly, the arch-devil, in the shape of a large goat, with a black human countenance, sat on a high chair, and the witches and demons paid homage by kneeling to him, and kissing his posteriors. The feast was lighted up with torches, all kindled at a light burning between the horns of the great goat. Among the viands there was no bread or salt; and they drank out of ox-hoofs and horses' skulls; but the meal neither satisfied the appetite nor nourished. After eating and drinking they danced to music played on a bagpipe with a horse's head for the bag, and a cat's tail for a chanter. In dancing, they turned their backs toward one

another. In the intervals they narrated to one another what mischief they had done, and planned more. The revel concluded with obscene debauchery; after which, the great goat burned himself to ashes, which were divided among the witches, to raise storms with. They returned as they came; and the husband was kept from being aware of the wife's absence by a stick being laid in the bed, which he mistook for her. The places of meeting were always such as had feelings of solemnity and awe attached to them, derived from tradition or otherwise; the more noted are known to have been places of sacrifice in heathen times (see WALPURGA).

The *prosecutions* for witchcraft form one of the most deplorable episodes in human history. They show more strikingly than anything else has ever done, on the one hand, what relentless cruelty human nature is capable of under the influence of a fanatical delusion; and on the other, how little reliance is to be placed on the concurrence of any number of witnesses when an extensive excitement prevails on a subject involving the sentiment of wonder. Multitudes will be found testifying, and testifying honestly, to alleged facts which fall in with the prevailing belief, but have no better foundation than their own heated imaginations.

In the early laws of Rome, the twelve tables, there were penal enactments against him who should bewitch the fruits of the earth, or conjure away his neighbor's corn into his own field. A century and a half later 170 Roman ladies were convicted of poisoning under the pretense of charms and incantations; which led to additional laws against such practices. But in all this, the penalties were directed against those who had done, or were believed to have done, positive injury to another; and this is probably the meaning of the Mosaic law against witchcraft. At all events in the heathen world, the mere possessing, or being believed to possess, supernatural powers, was not in itself a crime. It was feared, no doubt, as being liable to be turned to malicious purposes; but on the whole, magic was looked upon as a beneficial art, being, in fact, the only form of the healing art known, and in part also the religion of domestic life. This view of the subject continued to prevail for many centuries after the reception of Christianity. Constantine, in the 4th c., while ordaining capital punishment for those who practiced noxious charms against the life or health of others, is careful to protect from prosecution all magical means used for good—such as warding off hailstorms and excessive rains (*Codex Justin.* lib. ix. tit. 18); and the distinction between *black* and *white* magic was long kept up. It was through the prosecutions directed against heresy, which were systematically organized in the 11th c. (see INQUISITION), that the magic arts came gradually to be all dyed black alike. Along with errors in doctrine, the heretics were almost always accused of magical practices, and their secret meetings were represented as a kind of devil-worship, attended with all kinds of abominations. Thus sorcery and heresy became synonymous, and to the dread of supernatural power was added the feeling of pious horror. White magic, no less than black, was now looked upon as the work of Satan; and the counter-charms against the malice of him and his agents were to be sought only in the rites of the church as ministered by the accredited servants of heaven. The belief in this ecclesiastical white magic was as zealously cultivated by the Protestant clergy as by the Roman Catholic.

Fostered chiefly by the proceedings against heresy, the popular dread of witchcraft had been on the increase for several centuries; and numerous executions had taken place in various parts of Europe. At last, Innocent VIII., by his celebrated bull, *Summis Desiderantes*, issued in 1484, gave the full sanction of the church to the prevalent notions regarding sorcery, and charged the inquisitors and others to discover and put to death all practitioners of these diabolical arts. Two special inquisitors, appointed for Germany (to which country the bull was specially directed), Heinrich Institor and Jacob Sprenger, with the aid of a clergyman from Constance, Johannes Gremper, drew up the famous *Malleus Maleficarum*, or Hammer for Witches; in which the whole doctrine of witchcraft was systematized, a regular form of trial laid down, and a course of examination appointed by which inquisitors everywhere might best discover the guilty. From this we may date the beginning of the witch-mania proper. The edict of 1484 was subsequently enforced by a bull of Alexander VI. in 1494, of Leo X. in 1521 and of Adrian VI. in 1522—each adding strength to its predecessor, and the whole serving to increase the agitation of the public mind upon the subject. The results were dreadful. A panic fear of witchcraft took possession of society; every one was at the mercy of his neighbor. If any one felt an unaccountable illness, or a peculiar pain in any part of his body, or suffered any misfortune in his family or affairs; or if a storm arose, and committed any damage by sea or land, or if any cattle died suddenly, or, in short, if any event, circumstance, or thing occurred out of the ordinary routine of daily experience—the cause of it was witchcraft. To be accused, was to be doomed; for it rarely happened that proof was wanting, or that condemnation was not followed by execution. Armed with the *Malleus Maleficarum*, the judge had no difficulty in finding reasons for sending the most innocent to the stake. If the accused did not at once confess, they were ordered to be shaved and closely examined for the discovery of devil's marks, and if any strange mark was discovered, there remained no longer any doubt of the party's guilt. Failing this kind of evidence, torture was applied, and this seldom failed to extort the desired confession from the unhappy victim. A large proportion of the accused witches, in order to avoid these preliminary horrors, confessed the crime in any terms which were

dictated to them, and were forthwith led to execution. Other witches seemed to confess voluntarily, being probably either insane persons, or feeble-minded beings, whose reason had been distorted by brooding over the popular witchcraft code.

In Germany the prosecutions were carried to a frightful extent. In the small bishopric of Bamberg 600 fell victims to the delusion in the course of about four years; and in Würzburg, which is not much larger, 900. In the small district of Lindheim, a twentieth part of the population were sacrificed in the same space of time. Similar accounts are on record regarding the other countries of Europe. In Geneva, in three months (1515-16), 500 persons were burned. In the district of Como 1000 were burned in one year (1524), and 100 per annum for several years afterward. In France, about the year 1520, fires for the execution of witches blazed in every town; and throughout the century the provincial parliaments were incessantly occupied with witch-trials and enactments against them, especially against that form of the superstition known as *lycanthropy* (q.v.; see also *WERE-WOLF*).

In England and Scotland, the witch mania was somewhat later in setting in than on the continent; but when it did so, it was little if at all less virulent—the reformation notwithstanding. The statute of Elizabeth, in 1562, first made witchcraft in itself a crime of the first magnitude, whether directed to the injury of others or not; and the act of James VI., in the first year of his reign in England, defines the crime still more minutely: "Any one that shall use, practice, or exercise any invocation of any evil or wicked spirit, or consult or covenant with, entertain or employ, feed or reward any evil or wicked spirit, *to or for any purpose*; or take up any dead man, etc.; such offenders, duly and lawfully convicted and attainted, shall suffer death." Many years had not elapsed after the passing of the statute, ere the delusion, which had heretofore committed but occasional local mischief, became an epidemical frenzy, devastating every corner of England. The poor creatures who usually fell victims are thus described by an able observer: "An old woman with a wrinkled face, a furred brow, a hairy lip, a gobber tooth, a squint eye, a squeaking voice, or a scolding tongue, having a ragged coat on her back, a spindle in her hand, and a dog by her side—a wretched, infirm, and impotent creature, pelted and persecuted by all the neighborhood because the farmer's cart had stuck in the gateway, or some idle boy had pretended to spit needles and pins for the sake of a holiday from school or work"—such were the poor unfortunates selected to undergo the last tests and tortures sanctioned by the laws, and which tests were of a nature so severe that no one would have dreamed of inflicting them on the vilest of murderers. They were administered by a class of wretches, who, with one Matthew Hopkins at their head, sprung up in England in the middle of the 17th c., and took the professional name of *witch-finders*. The practices of the monster Hopkins, who, with his assistants, moved from place to place in the regular and authorized pursuit of his trade, will give a full idea of the tests referred to, as well as of the horrible fruits of the witchcraft frenzy in general. From each town which he visited, Hopkins exacted the stated fee of 20s., and in consideration thereof, he cleared the locality of all suspected persons, bringing them to confession and the stake in the following manner: He stripped them naked, shaved them, and thrust pins into their bodies to discover the witch's mark; he wrapped them in sheets, with the great toes and thumbs tied together, and dragged them through ponds or rivers, when, if they sank, it was held as a sign that the baptismal element did not reject them, and they were cleared; but if they floated—as they usually would do for a time—they were then set down as guilty, and doomed. He kept them fasting and awake, and sometimes incessantly walking, for 24 or 48 hours, as an inducement to confession; and, in short, practiced on the accused such abominable cruelties, that they were glad to escape from life by confession. If a witch could not shed tears at command, said the further items of this wretch's creed, or if she hesitated at a single word in repeating the Lord's prayer, she was in league with the evil one. After he had murdered hundreds, and pursued his trade for many years—from 1644 downward—the tide of popular opinion finally turned against Hopkins, and he was subjected, by a party of indignant experimenters, to his own favorite test of swimming. It is said that he escaped with life, but from that time forth he was never heard of again.

The era of the long parliament was that, perhaps, which witnessed the greatest number of executions for witchcraft. *Three thousand persons* are said to have perished during the continuance of the sittings of that body, by legal executions, independently of summary deaths at the hands of the mob. Witch-executions, however, were continued with nearly equal frequency long afterward. One noted case occurred in 1664, when the enlightened and just sir Matthew Hale tried and condemned two women, Amy Dunny and Rose Callender, at Bury St. Edmunds, for bewitching children. It is stated that the opinion of the learned sir Thomas Browne, who was accidentally present, had great weight against the prisoners. He declared his belief that the children were truly bewitched, and supported the possibility of such possessions by long and learned arguments, theological and metaphysical. Yet sir Matthew Hale was one of the wisest and best men of his time, and sir Thomas Browne had written an able work in exposition of popular fallacies! Chief-justices North and Holt were the first individuals occupying high places who had at once the good sense and the courage to set their faces against

the continuance of this delusion, and to expose the general absurdity of such charges (1694). Summary executions, however, continued for some years to be still common, in consequence of confessions extracted after the Hopkins fashion. In 1716, a Mrs. Hicks and her daughter, aged nine, were hanged at Huntingdon for selling their souls to the devil, and raising a storm by pulling off their stockings and making a lather of soap! With this crowning atrocity, the catalogue of murders in England closes.

In Scotland, witchcraft as a crime *per se* was first made legally punishable by an act passed in the reign of Mary (1563). On coming to execute the functions of majesty, James VI. made numerous official investigations into alleged cases of witchcraft, and derived a pleasure in questioning old women respecting their dealings with Satan. In 1590, James, it is well known, made a voyage to Denmark to bring home his appointed bride, the princess Anne. Soon after his arrival, a tremendous witch-conspiracy against the happy conclusion of his homeward voyage was discovered, in which the principal agents appeared to be persons considerably above the vulgar. The king had all the accused brought before himself for examination, and even superintended the tortures applied to them to induce confession. One of them, Mrs. Agnes Sampson, declared that one great object with Satan and his agents was to destroy the king; that they had held a great witch-convention at North Berwick for no other end; and that they had endeavored to effect their aim on many occasions, and particularly by raising a storm at sea when James came across from Denmark. The witches demanded of the devil why he bore such hatred to the king, who answered that the king was the greatest enemy he had in the world. On this occasion, 30 persons were executed on the Castle-hill of Edinburgh. These proceedings, no doubt, gave occasion to the famous work on Demonology which James VI. published shortly after. The removal of James to England moderated but did not altogether stop the prosecutions. As the spirit of Puritanism gained strength, however, they again increased. The general assembly was the body in fault on this occasion, and from this time forward, the clergy were the great witch-finders in Scotland. The assembly passed condemnatory acts (1640, 1642, 1644, 1645, 1649), and with every successive act the cases and convictions increased with even a deeper degree of attendant horrors than at any previous time. At a single circuit held at Glasgow, Stirling, and Ayr, in 1659, 17 persons were convicted and burned for this crime. The popular frenzy seems to have exhausted itself by its own virulence in 1661-62. After this period, the dying embers of the delusion only burst out on occasions here and there into a momentary flame. The last regular execution for the crime is said to have taken place at Dornoch in 1722, when an old woman was condemned by David Ross, sheriff of Caithness. The number of victims in Scotland from first to last has been estimated at upward of 4,000.

In the British colonies of New England the witchcraft mania raged with peculiar intensity. As in Scotland and elsewhere, the clergy were the prime movers. Two clergymen have obtained a special and unenviable notoriety for the part they acted in this matter. The one was the rev. Cotton Mather (q.v.), a man who was considered a prodigy of learning and piety, but whose writings and proceedings in regard to the trial and execution of witches, of which he was the chief instigator, show a degree of fanaticism, credulity, and blind cruelty that is almost incredible. The other, a Samuel Parris, minister of Salem, made use of the popular feeling to gratify his own spite at individuals. At last, in the "Salem tragedy," as it is called, in 1692, the executions, torturings, and imprisonments rose to such a height as to be no longer endurable, a complete revulsion of public feeling took place, and the delusion was broken. For details of New England witch-trials, we must refer to No. 141 of *Chambers's Miscellany of Tracts*.

Dr. Sprenger, in his *Life of Mohammed*, computes the entire number of persons who have been burned as witches during the Christian epoch at *nine millions*.

Throughout the middle ages, it is doubtful if one person could have been found who doubted the reality of witchcraft; and it was not till the middle of the 16th c. that any one had courage to raise his voice against the enormities which the delusion was occasioning. The first, probably, to do so was a physician of the name of J. Weier (*De Præstigiis Dæmonum*, etc.), in Germany, in 1563. He was followed in 1584 by Reginald Scot (q.v.), "a solid and learned person, beyond almost all the English of that age" (Hallam), who demonstrated the absurdity and impossibility of the prevalent notions. The delusion, however, was still in the ascendant, and found multitudes of defenders, who branded the skeptics as "Sadducees." The most prominent of these champions was James VI. of Scotland, who, through his treatise on Demonology (1597), and his activity in the inquisition of cases, is entitled to rank with pope Innocent and the inquisitor Sprenger, as at the same time a chief enemy and chief encourager of witchcraft. At last the world began to awaken from the horrid nightmare; the feelings of the humane began to be shocked by the continued butchery, and the more intelligent to question, if not the existence of witchcraft, at least the evidence on which the accused were for the most part condemned. Advocates took courage to defend a reputed witch, and judges (like North and Holt in England), to throw cold water on the proceedings; and the frenzy gradually subsided all over Europe. Individual cases occurred later on the continent than in Britain. A man was executed at Würzburg, in 1749, on a charge of sorcery; and a witch was burned at Glarus, in Switzerland, in 1782. Perhaps the latest

instance of a judicial execution for witchcraft occurred in 1793, in the grand duchy of Posen. The laws against witchcraft were formally repealed in England in 1736; in Austria, not till 1766.

The cessation of judicial proceedings, however, did not all at once put an end to popular outrages on supposed witches. In 1751 an aged female pauper and her husband were killed by a mob near Tring, in Staffordshire; and for the murder, one of the perpetrators was tried and executed. Not longer ago than 1863, a reputed wizard was drowned in a pond at the village of Hedingham, in Essex; and it was considered worthy of notice that nearly all the sixty or seventy persons concerned in the outrage were of the small-tradesmen class, none of the agricultural laborers being mixed up in the affair. Besides such violent outbreaks, striking revelations are frequently made in the course of judicial proceedings, how deep-seated and general the dread of witches continues to be throughout the more ignorant strata of European society, especially in rural places; and, concurrent with this, the faith in the skill of certain "wise men" and "wise women" (white witches) to counteract their malicious practices. As recently as March, 1867, a man calling himself Dr. Harris (S. Wales), was committed for trial at the next Radnorshire assizes, for duping various persons, by persuading them that their ailments were caused by their being "witched," and pretending to cure them by giving them written charms to wear. From one man he had extorted £4, from another £6, and so on.

The belief in magic or sorcery, in fact, continues to be the most energetic belief of the ignorant and degraded all over the world, no matter what their nominal religion is. To the mass of the adherents of Buddhism in central Asia, the lama or priest is merely a wizard who knows how to protect them from the malignity of evil spirits; and, according to Livingstone and other travelers, trials and executions for witchcraft are at this day common throughout Africa, as they were in Europe in the 17th c., and under forms ludicrously similar. See ORDEAL, MAGIC.

Of the numerous books written about witchcraft, we note the following: *Sadducismus Triumphatus, Sadducismus Vanquished, or, Considerations about Witchcraft*, a work vindicating the belief in witchcraft, by Dr. Joseph Glanvil, chaplain-in-ordinary to Charles II., who was one of the first fellows of the royal society, and wrote a meritorious treatise showing the value of skepticism in science. R. Baxter (q.v.), in his *Certainty of the World of Spirits*, upholds the same side. Balthazar Bekker, a Reformed Dutch clergyman, was the first, at the end of the 17th c., to attack the very foundation of the superstition—namely, the belief in the devil himself, or, at all events, in the possibility of his interference in the affairs of this world. A successor of Glanvil—D. F. Hutchinson, chaplain to George I., in his *Historical Essay concerning Witchcraft* (1718), writes from the skeptical point of view. Sir W. Scott, *Letters on Demonology and Witchcraft*, entertaining, but superficial. Brand's *Popular Antiquities of Great Britain*, edited by Sir H. Ellis (1855), gives a collection of witch-beliefs put together without much connection or method. H. Williams's *Superstitions of Witchcraft* (1865) takes a wide historical view of the subject, and evinces extensive reading. C. Mackay gives a good digest of it in brief space in a section of his work on *Extraordinary Popular Delusions* (1841). Thomas Wright's *Narratives of Sorcery and Magic*, 2 vols. (1852), contains a large collection of the most interesting stories of individual cases. Soldan, *Geschichte der Hexenprozesse* (Stutt. 1843); Ennemoser, *Geschichte der Magie*, 2d ed. (Leip. 1844; translated by W. Howitt, Lond. 1854). L. F. Alfred Maury, *La Magie et l'astrologie dans l'Antiquité et au Moyen Age* (Lond. 1869), attempts to give a philosophy or theory of all superstitious beliefs. J. Grimm, *Deutsche Mythologie*, with his wonted sagacity and prodigality of learning, traces the several elements of the witch-creed to their roots in the beliefs of pagan times. Haas, *Die Hexenprozesse* (1865); Roskoff, *Geschichte des Teufels* (1869); Buckle, *History of Civilization* (1857-61); Lecky, *History of Rationalism* (1865); Tylor's *Primitive Culture* (1871); Conway, *Demonology and Devil Lore* (1878).

WITCH-HAZEL, *Hamamelis Virginica*, a North American shrub of the natural order *hamamelidaceæ*. This order contains only a very small number of species, much diffused over the world, but none of them European; shrubs or small trees, with alternate, stipulate, feather-veined leaves, and small axillary unisexual flowers. The witch-hazel is often not more than 6 or 8 ft. in height, dividing at the base into several cylindrical grayish branches. Sometimes it attains a height of 20 or 30 feet. The leaves are about four inches long, and two or three broad. The flowers are clustered, yellow and showy, with long linear petals. They appear in winter, or at the season when other trees and shrubs are parting with their leaves. The English name is derived from the supposed virtues of a forked twig as a divining-rod. The bark is much esteemed as a sedative and disientic.

WITENA-GEMOT (A.-S. *witena*, genitive plu. of *wita*, a wise man, from *witan*, to know, and *gemot*, assembly, from *meotan*, to meet), the great national council of England in Anglo-Saxon times, by which the king was guided in all his main acts of government. Each kingdom had its own witena-gemot before the union of the Heptarchy in 827, after which there was a general one for the whole country. It was composed of the chief ecclesiastics, the ealdormen (see ANGLO-SAXONS) of shires, and some of the chief proprietors of land. It would rather appear, though the latter is not quite free from doubt, that the lesser thanes, who formed part of the *scir-gemot*, or next inferior court, were not

entitled to form part of the general council. In the year 934, there were present at one of these assemblies king Athelstane, four Welsh princes, two archbishops, seventeen bishops, four abbots, twelve dukes, and fifty-two thanes.

The powers of the witenagemot seem to have been very extensive. The king's title, however, hereditarily unexceptionable, was not considered complete without its recognition, and it possessed the power of deposing him. It could make new laws and treaties; and along with the king it appointed prelates, regulated military and ecclesiastical affairs, and levied taxes. Without its consent, the king had no power to raise forces by sea or land. It was also the supreme court of justice, civil and criminal. The Witenagemot was abolished by William the conqueror, and its powers were only in part transmitted to parliament.—See Hallam's *Medieval Ages*, c. 8; sir F. Palgrave's *Rise and Progress of the English Commonwealth*; and Kemble's *Saxons in England*.

WITHDRAWING A JUROR, a somewhat clumsy method by which a trial is brought to a close after the impaneling of the jury, without either non-suiting the plaintiff or giving him a verdict. It usually takes place at the suggestion of the court when some unlooked-for event renders further trial at the time obviously improper. The agreement of the parties is necessary. The effect of withdrawing one of the twelve jurors from the box is to put an end to that trial, leaving the parties to pay each his own cost.

WITHER, GEORGE, was b. on June 11, 1588, at Bentforth, an estate in Hampshire of which his father was proprietor, and which in due course fell to the son. He was educated at the grammar-school of Colemore, and afterward at Magdalen college, Oxford, which he entered in 1604. He remained there several years, and after passing some time at home, he went to London, and entered himself at Lincoln's inn. His bent was, however, rather to literature than law; and he shortly became known in certain circles as a writer of clever verses. In 1613 he came before the public in a volume of satire, the title of which, *Abuses Stript and Whipt*, in some sort defines its contents. Certain things in the book were considered offensive by the authorities, and he was sent to the Marshalsea prison, and kept there for some months. During his imprisonment were composed his *Satire to the Kings* and his *Shepherd's Hunting*. In 1622 appeared a collection of his poems under the title *Mistress of Philarete*, and in 1635 his *Emblems, Ancient and Modern*. Though he had very much identified himself with the party of the Puritans, among whom his writings were most popular, on the breaking out of civil disturbance, he served as a captain of cavalry in the ill-judged and abortive expedition of Charles I. against the Scotch covenanters in 1639. When a little later, however, the general discontent determined itself into the grand struggle between the king and the English parliament, he promptly sided with the latter, and raised a troop of horse for its service by the sale of his estate. In the army of the parliament he attained the rank of major; but of his special services not much is known. On one occasion he was taken prisoner, and is said to have owed his life to a joke of Denham's, who besought the royalists to spare his life, on the ground that so long as Wither lived, he (Denham) was not the worst poet in England. On the final triumph of the side with which he had ranged himself, it appears that opportunities were afforded him of feathering his nest rather comfortably by the spoil of the defeated party. With the restoration naturally a reverse came; and as the reputed author of a pamphlet entitled *Vox Fulgi*, of a so-called seditious tendency, he was committed to the tower, and an impeachment of him having been ordered, his life for a time seemed to be in some danger. The impeachment was not, however, proceeded with, and sooner or later—the date seems somewhat uncertain—he obtained his liberty. He died in London on May 2, 1667.

Wither was an excessively voluminous writer. Upward of 100 separate publications of his have been noted by modern bibliographers (see 1st and 2d vols. of Park's *British Bibliography*), yet, after his death, his poetry fell into oblivion, or, so far as remembered, was regarded with such contempt that we find him introduced by Pope in the *Dunciad*, as "wretched Withers." A later time has, however, revised this decision; the grace, sweetness, fancy, and charm of natural simplicity which distinguish not little of his verse have since been sufficiently recognized; and a modest niche in the temple has been accorded him, from which he cannot now be degraded. The men to whom the resuscitation of his fame is chiefly owing are Southey, Lamb, and sir Egerton Brydges. In his *Shepherd's Hunting*, in particular, passages occur of such rare and finished beauty, that no collection of the choicest things in English poetry could be held to be complete which should omit them. His *Hymns and Songs of the Church* were edited, with an introduction by Mr. Ed. Farr, in 1856. By far the best and most complete account of Wither's life and writings is to be found in Wilmott's *Lives of the Sacred Poets* (Lond. 1834).

WITHERS, JONES MITCHELL, b. Ala.; graduated West Point, 1835; commissioned in the cavalry and resigned the same year. He served in the Creek troubles and the Mexican war. From 1848 to 1861 he was engaged in business in Mobile, and for the last ten years was mayor of the city. He entered the confederate service in 1861; was made a brig.gen.; commanded a division at the battles of Shiloh and Stone river, and was promoted to be maj.gen.

WITHERS, ROBERT E., b. Va., 1821; educated at the university of Virginia, where he took a medical degree. He served in the confederate army during the war of the rebellion, edited the *Lynchburg News*, 1866-68, was lieutenant-gov. in 1873, and a U. S. senator, 1875-81.

WITHERSPOON, JOHN, D.D., LL.D., 1722-94; b. Scotland; educated at the university of Edinburgh; minister of different parishes, 1745-68; pres. of the college of New Jersey, 1768-94, and prof. of divinity; during the suspension of the college by the war, was, in 1776, a member of the constitutional convention of New Jersey, and, for six years, of the Continental congress, where he sat "in full clerical dress;" advocated and signed the Declaration of Independence and the articles of confederation; an active member of several important committees and of the board of war, visiting the camps to increase the comfort of the troops; when the college was re-opened lectured there on moral philosophy and rhetoric; raised greatly the reputation of the institution, and improved its financial affairs; visited England in 1783 and 1784 to solicit funds, but with little success; was blind the last two years of his life. His works were collected at New York in 4 volumes, 1800, and at Edinburgh in 9 volumes, 1804. Among them are, *Ecclesiastical Characteristics*; *Essay on Justification*; *Inquiry into the Nature and Effects of the Stage*; *Legislative Authority of the British Parliament*; *Essays on Important Subjects*; *Essay on Money and The Druid*. A statue of him was erected at Fairmount park, Philadelphia, during the centennial exhibition, 1876.

WITNESS, a person summoned, or capable of being summoned, by a court of law, or some officer authorized to take evidence relating to a judicial or other proceeding. All persons are liable to be witnesses, either voluntarily or involuntarily, and it is a duty which every citizen owes to his fellow-citizens, to be available whenever his testimony is deemed desirable. It is a compulsory duty, and the presence of any person can be enforced, both in civil and criminal cases. In England the usual mode of summoning a witness in a court of law, is by serving him with a *subpœna*, i. e., a formal writ proceeding in the queen's name, reciting that a certain action is pending in a court named, and a trial is to take place, and commanding the witness to lay aside all and singular business and excuses, and appear at the time and place before the court mentioned, under a penalty (*sub pœnâ*) of £100. This is called a *subpœna ad testificandum*. The corresponding term in Scotch law is diligence (q. v.). If the witness is required to produce a document in his possession, it is called a *subpœna duces tecum*, and he is told in the writ to bring the document. If a witness do not attend at the time and place mentioned, he is liable to be punished, either by attachment, i. e., summary imprisonment for contempt, or by an action for damages at the suit of the party summoning him. The *subpœna*, or notice to attend, must be served a reasonable time before the witness is wanted, and it is generally necessary to give a day's notice beforehand. During a witness's attendance on this public duty, he is privileged from arrest: thus, he cannot be taken into custody for debt while he is going to, remaining at, or returning from the court. Moreover, he is entitled, before he go to the court, to have his reasonable traveling expenses paid to him, and a sum for subsistence while he remains in attendance. He is also entitled to a reasonable allowance for his lost time while attending a civil trial, and courts of law allow 5s. per day to a laborer or journeyman, 7s. 6d. to a master-tradesman, and £1 1s. to £3 3s. to professional men; to females, according to their station in life. A witness may, in a civil case, but not in a criminal case, refuse to give evidence until his expenses are paid. A witness, before examination, is required to take an oath, which may be in any form which he considers most binding on his conscience; but he must at least believe in a God and a future state of rewards and punishments. When a witness is examined, he is generally asked specific questions, first, by the party calling him, and during this examination in chief, the rule is that he is not to be asked leading questions, i. e., questions which suggest the answer that is required. The opposite party is then allowed to cross-examine the witness, and in doing so, may ask leading questions, or test in every way the truth of witness's statement. After this, the witness is re-examined. There is a technical rule that the party calling a witness is not allowed to impeach his credit, or ask anything having that effect. There are certain questions which a witness may refuse to answer. Such are questions the answer to which might render the witness liable to a criminal charge or penalty; but he cannot refuse if the effect would merely be to render him liable to a civil action, or merely to degrade him. If a witness live in a foreign country, he cannot be compelled to come to this country by any *subpœna*, and therefore the only way of getting his evidence is to send a commission to some person in the foreign country to take the examination there. Where, however, a witness residing in Scotland is required for a trial in England, and *vice versa*, he may now be compelled by *subpœna* to attend in the same way as if he had resided in England or Scotland respectively. If the witness is aged or infirm, so that his attendance at the trial would be dangerous to him, he may be examined by a commissioner or examiner before trial. In England, when a witness is sworn, a New Testament is put in his hand, and after the officer of court repeats the form he kisses the book. This form is "The evidence you shall give to the court and jury, touching the matter in question, shall be the truth, the whole truth, and nothing but the truth." When the witness is a Jew or foreigner, the form varies. In Scotland, the witness, when sworn, stands, holding up his right

hand, while the judge of the court repeats this form: "I swear by Almighty God, as I shall answer to God at the great day of judgment, that I shall tell the truth, the whole truth, and nothing but the truth, in so far as I know or shall be asked."

WITNESS (*ante*) is incompetent to testify if too young to understand the obligation of the oath, or, for other reasons, insensible to such obligation; if insane or intoxicated, or convicted of infamous crimes, if party to the record or directly interested in the result of the suit, or if in possession of privileged communications (such as an attorney's consultation with clients, or state secrets); husband and wife are incompetent to testify against each other. *These are common law rules*, and are greatly modified by the statutes of the states; the tendency being very strong to admit witnesses, and allow the jury to judge of their credibility. Thus, parties are allowed to testify in their own behalf in civil, and in most states, in criminal cases; and in many cases husband and wife may testify against each other. A party cannot be compelled to testify against himself, nor need a witness answer questions tending to incriminate himself. But an accused person, if he chooses to go on the stand, is subject to cross-examination. The U. S. judiciary act, 1793, provides that in cases not covered by the U. S. constitution, treaties, or statutes, the laws of evidence of the states shall govern in U. S. courts. In all states persons having conscientious scruples against taking an oath are allowed to affirm.

WITNEY, a small market and manufacturing t. of Oxfordshire, in a dreary district on the Windrush, 10 m. w.n.w. of Oxford. It is a neat and well-built town, consisting principally of two streets. There is a spacious cruciform church, a blanket-hall (built 1721), a town-hall, and cross (1683). It is celebrated for its blankets, which are distinguished for their peculiar whiteness, communicated, it is said, by the sulphurous qualities of the waters of the Windrush, used in their manufacture. This branch of industry has, however, somewhat declined, from the introduction of machinery for blanket-making in other towns. Gloves, malt, pilot-cloths, and felting for paper are also manufactured. The Saxon form of the name is *Witaneyce*, and means, "the island of the wise men," or "the island of the parliament." Witney is connected by a branch with the Great Western railway. Pop. '71, 2,976.

WITTEKIND, a Westphalian chieftain, the most celebrated leader of the Saxons against Charles the great, made his first appearance as leader in the expeditions which the Saxons undertook in 774 against the fortress of Eresberg, in Westphalia, and the Frankish province of Hesse, while Charles was subduing the Lombards. When most of the Saxon nobles submitted to the emperor Charles at the imperial diet at Paderborn in 777, Wittekind fled to Siegfried, king of Jutland, whose sister Geva he is said to have married. In 778 he returned, and when Charles was absent in Spain, began to lay waste the Rhine country. Charles's return obliged him again to take refuge in Jutland; but in 782 he fell upon the Frankish army by surprise at the Sintelberg, and entirely annihilated it—an act for which Charles took frightful vengeance by the execution of 4,500 Saxons. On this, all the Saxon tribes rose in arms, and the war was again led by Wittekind until 785, when Charles entered into negotiations with him, the result of which was that Wittekind repaired to the emperor's camp at Attigny in Champagne, and received baptism. After that, he appears no more in history. According to the legend, however, that is still current among the people in Westphalia, Charles promoted Wittekind to be duke of the Saxons, and made over Engers to him. From his castle, called Babilonie, situated in the neighborhood of Lübeck, he is said to have ruled with gentleness and justice till 807, when he met his death in a campaign against duke Gerald of Swabia. His bones repose in the parish church of Engers, in the duchy of Ravensberg, where Charles IV., in 1377, erected a monument to him; and on Oct. 18, 1812, another monument in his honor was erected at Minden by the Westphalian society. The higher of the two hills which form the Westphalian gates on the Weser, near Minden, bears the name of Wittekindsberg.

WITTEN, a t. in Westphalia, Prussia, on the Ruhr river; pop. '71, 15,160. Much coal is mined in the surrounding district, and there are extensive manufactures of iron, steel, and glass.

WITTENBERG, a t. of Prussian Saxony, stands on the Elbe, 55 m. s.w. of Berlin. It is no longer a fortified place, though till 1873 it was a fortress of the third rank. It is interesting as having been the capital of the electorate of Upper Saxony, as the cradle of the reformation, and as containing the remains of the reformers Luther and Melancthon. The once famous university, in which Luther was professor, and mentioned by Shakespeare as the school where Hamlet studied, is now removed and incorporated with that of Halle. In the *Stadt-Kirche* are two remarkable but poor pictures supposed to be by their contemporary and friend Cranach, in one of which Melancthon is represented as dispensing the sacrament of baptism, and Luther as preaching to a congregation, of which the two foremost figures are his wife and son. In the *Schloss-Kirche* are the tombs of Luther and Melancthon, as well as those of Frederick the wise (with a noble bronze statue by Vischer) and John, electors of Saxony. Upon the doors of this church—burned down by the French, but replaced by others of metal—Luther hung up his 95 theses against the papal doctrine of indulgences. The house of the great

reformer, containing his chair, table, etc., and two portraits of him by Cranach, remains almost unaltered. The houses of Melancthon and Cranach are also shown. In the market-place is a bronze statue of Luther by Schadow, not far from which is also one of Melancthon; and outside the Elster gate, a spot is pointed out where Luther burned the papal bull. Manufactures of woolen and linen goods, hoisery, and leather are carried on. Brandy is distilled, and beer brewed. Pop. '75, 12,479.

WOAD, *Isatis*, a genus of plants of the natural order *crucifera*, having a one-celled one-seeded, laterally compressed pouch, with the valves keeled and eventually separating. It contains only a few species, mostly natives of the countries around the Mediterranean. DYER'S WOAD (*I. tinctoria*) is sometimes found in cultivated fields in England, but most probably has been introduced, as it was formerly much cultivated both in England and Scotland, for the sake of a blue dye obtained from its root-leaves. The use of this dye has in great part ceased, in consequence of the more general introduction and diminished cost of indigo. Dyer's woad is a biennial plant, with oblong crenate root-leaves about a foot in length, on pretty long stalks; an upright, much branched leafy stem, about 3 ft. high; small yellow flowers, and large seed-vessels, about half an inch long and 2 in. wide, hanging from slender stalks. The leaves when cut are reduced to a paste, which is kept in heaps for about 15 days to ferment, and then formed into balls which are dried in the sun, and which have a rather agreeable smell, and are of a violet color within. These balls are subjected to a further fermentation before being used by the dyer. When woad is now used, it is always in union with indigo, which improves the color. Even by itself, however, it yields a good and very permanent blue. It is supposed that woad was the dye used by the Picts for painting their persons. Woad is now cultivated only to a very small extent in Britain.

WOBURN, a township of Massachusetts, 10 m. n.w. of Boston, on the Boston and Lowell railway, containing numerous factories supplied with water-power, country residences of wealthy Bostonians, numerous churches, academy, etc. Pop. '60, 6,778; '70, 8,560; '75, 9,568.

WOBURN, (*ante*) a t. in Middlesex co., Mass.; 10 m. n.w. of Boston, on the Boston, Lowell, and Nashua railroad; pop. '80, 10,938. There are three villages—Woburn Centre, East Woburn, and West Woburn. The town was founded in 1640. There are 3 banks, a library, academy, and many churches and schools. The chief industry is the manufacture of leather, and there are also iron, chemical, and glue works. The town is lighted by gas, and the main villages are connected by a horse railroad. The region is exceedingly pleasant, and there are many fine residences of Boston business men.

WODEN. See ODIN.

WODROW, ROBERT, the second son of James Wodrow, professor of divinity in the university of Glasgow, was b. at Glasgow in the year 1679. He was educated at the university of his native city, and after passing through the classes in arts, studied theology under his father. At an early age he devoted a considerable portion of his time to historical researches, and to this taste he probably owed his appointment as librarian to the university. He did not hold this office long. Having finished his theological studies, in the year 1703 he received a license to preach from the presbytery, and in the month of October of the same year was appointed minister of Eastwood, a parish in the co. of Renfrew, at no great distance from Glasgow. In that parish he remained till his death, faithfully discharging the duties of his office, and declining offers which were made to him of appointments to pastoral charges of more importance. He had been brought up in the strictest principles of Presbyterianism, and he zealously adhered to the party in the established church, which was most strenuous in maintaining those principles, and in resisting what were deemed to be the encroachments of the secular power. Soon after his settlement at Eastwood, he began to devote his leisure hours to what became the chief object of his life—the writing of a history of the church of Scotland from the restoration to the revolution. He spared no pains and no expense, so far as his limited means could afford, in collecting materials for this work. He corresponded with all persons who could give him any information, and transcribed with his own hand the civil and ecclesiastical records bearing on his subject. The work was published in 2 folio vols., the first in 1721, and the second in the following year. It was dedicated to king George I., whom the author styles "the best as well as the greatest of kings;" and in the year 1725 he received an order on the Scottish exchequer for £105, as a mark of the royal bounty. It is probable that this sum was the chief pecuniary recompense of his labors; but considerations of that nature formed no part of the inducements which had led him to undertake the work. A second edition of the history, in 4 vols. 8vo, was published at Glasgow in 1828, under the editorship of Dr. Robert Burns. Wodrow contemplated other works, chiefly of a biographical character, illustrative of the ecclesiastical history of Scotland. None of these were published till the present century. Two vols. of his collections on *The Lives of the Scottish Reformers and Most Eminent Ministers*, and 4 vols. entitled, *Analecta, or a History of Remarkable Providences*, have been printed by the Maitland club. Three vols. of his correspondence were published by the Wodrow society—a literary club called after his name, and instituted in 1841 for the publication of the works of the fathers and early writers of the reformed

church of Scotland. This correspondence, which extends from the year 1709 to the year 1731, throws much light on the ecclesiastical history of the time, and contains letters addressed to persons of some note in their day, not only in Scotland, but in England, Ireland, and North America. Wodrow's health was impaired by the eagerness with which he prosecuted his laborious studies. He died Mar. 21, 1734, in the 55th year of his age. His great work—the one by which his name is generally known—is the history. It is what it professes to be in the title-page, a "History of the Sufferings" of the Presbyterian church, rather than an ecclesiastical history of the period. This of itself implies a one-sided character, and warns its readers that they need not expect an account of events not coming within its limited range. Of its great value as a store-house of materials to the student of Scottish history, no one who has examined its pages can have a doubt. As little hesitation will there be in regard to the absence of every grace of style. The only question will be as to the degree of credit to be given to the facts which the writer relates. So far as concerns his fidelity in transcribing records, and incorporating in the text the narratives furnished to him, there is no reason to doubt his general accuracy. But beyond this nothing can be said. His credulity was so great as to make him entirely unable to give any weight to intrinsic improbabilities or the conflict of external evidence. He could rarely admit a fault in those of his own side, and it is hardly an exaggeration to say that he could never see a virtue in his opponents. Much of his history is gathered from the records of the privy council of Scotland, and an examination of these valuable and voluminous papers will make it pretty evident that Wodrow disingenuously neglected to extract particulars which tell against his party. It is obvious, therefore, that in the perusal of his work, allowance must be made, not only for the absence of whatever does not come within its proper subject, but also for exaggerations of the virtues and sufferings of one party, and the crimes and errors of the other. The fullest memoir of Wodrow is that which is prefixed by Dr. Burns to his edition of the history. Interesting details of his domestic life and of his labors and studies will be found in the printed volumes of his correspondence.

WOFFINGTON, MARGARET, 1718-60, b. Dublin, Ireland, of poor parents. When a child she appeared in an itinerant show troupe. Her first appearance as an actress in comedy was in Dublin, and she there made a great success. In 1740 she played at Covent Garden theater, London; became a popular favorite and remained there until 1759, when she retired from the stage. For some years she lived with Garrick, but quarreled with him. The last part of her life was spent in respectable retirement.

WOJWODA (Polish, *Wojewoda*), an old Slavonic word (composed of *woi*, warrior, and *woditi*, to lead), means, literally, army-leader or general, and was from early times used by most Slavonic nations in this sense. Afterward, it became the title of the elective princes before hereditary monarchies were formed. Thus, at one time, the princes of Walachia and Moldavia were called Wojwodes; from the Greek emperors, with whom they had been in intimate alliance from the year 1439, these princes next received the title of despots, a title they afterward exchanged for that of *Hospodar*. The name was also given to the elective princes of Transylvania, whether dependent or independent. The same title of Wojwoda was applied to the elective chiefs of the Polish government before the beginning of the Piast dynasty. Later, the name denoted office and dignity; and was given in the former kingdom of Poland, to the governors in the districts, or Wojwodschafts, into which the kingdom was divided. They had at first only a military authority; afterward, however, both the civil and military were united in one person, so that Wojwoda and Palatine were one and the same. The name of Wojwodschaft was preserved in Russian Poland till recent times; now the Polish Wojwodschafts are named uniformly with the other Russian "governments." From 1849 till 1860 the Banat and part of the military frontier constituted a separate Austrian crownland, called "the Servian Wojwodina and Temeser Banat."

WOKINGHAM or **OAKINGHAM**, a small but improving market-t. of Berks, 7 m. s.e. of Reading, with which it is connected by rail. Shoes are made, and gauze and silks woven. In the original *Rose* inn, Gay, Swift, Pope, and Arbuthnot, being detained here by wet weather, composed among them the old song of *Molly Mog*. The parish church was rebuilt in 1864; the town-hall, with covered market, dates from 1860. Wokingham is the only town in Windsor forest. The ancient amusement of bull-baiting was continued here until within the last 50 years. Pop. '51, 2,272; '61, 2,404; '71, 2,868.

WOLCHOW or **VOLKHOV**. See **ILMEN, LAKE**, and **LADOGA, LAKE**.

WOLCOT, Dr. JOHN, better known under the pseudonym of *Peter Pindar*, was born at Dodbrooke, in Devonshire, in 1738. He was educated at the charge of his uncle, a respectable surgeon and apothecary of Fowey, in Cornwall. After studying medicine at the London hospitals, he accompanied sir William Trelawny to Jamaica in the capacity of medical attendant, but finding his professional income too small for his wants, he solicited and obtained a church-living in the island. His congregation consisted mostly of negroes, and Sunday being their principal holiday and market, the attendance at church was very limited. Sometimes not a single person came; and Wolcot and his clerk—the latter being an excellent shot—used at such times, after waiting for ten

minutes, to proceed to the seaside, to enjoy the sport of shooting ringtailed pigeons. The death of his patron, Trelawny, induced him to abandon both Jamaica and the church. Returning to England, he tried to establish himself as a physician at Truro, in Cornwall, but does not appear to have succeeded. At any rate, he soon removed to London, where he gave himself up to writing audacious squibs and satires in verse, on all sorts of persons, from king George III. down to the liverymen of London, and even lower. Wolcot's line in literature is not a very respectable one, and most people would probably prefer obscurity to a reputation like his; but, to do him justice, *Peter Pindar* is an excessively clever writer. Unscrupulous, impudent, and coarse, he is yet a master of burlesque humor and comic caricature: his verse is easy, vigorous, and idiomatic; and his fancy rich in the production of ludicrous metaphor. Two of his raciest pieces leveled at his sovereign, are *The Apple Dumplings and a King*, and *Whitbread's Brewery visited by their Majesties*. Besides these we may mention his *Lyrical Odes* on the royal academy exhibition (the earliest of his London efforts, and dating from 1782); *Bozzy and Piozzi, or the British Biographers*; *Peeps at St. James's*; *Epistle to a Fallen Minister*; *Odes to Mr. Paine*; and the *Lousiad, a Heroic-comic Poem*, in five cantos, etc. The *Lousiad* has its foundation in the fact that an obnoxious insect had been discovered in the king's plate among some green peas, which produced a solemn decree that all the servants in the royal kitchen were to have their heads shaved. Some of Wolcot's serious effusions actually possess considerable merit. If the matter, or rather the themes of his verse, had been less worthless, it would have stood a better chance of permanent popularity. In his own lifetime, his pieces were greedily read, and he had an annuity from the book-sellers of £250 for the copyright of them. He was considered so formidable a personage that the ministry are said to have endeavored to bribe him into silence. Wolcot, who records this proof of his power, also asserts the incorruptibility of his patriotism. He died Jan. 14, 1819.

WOLCOTT, OLIVER, LL.D., 1726-97; b. Conn.; son of Roger. He graduated at Yale college in 1747; and, during the French wars, commanded a company stationed on the n. frontier. He was sheriff of Litchfield co. in 1751; a member of the council, 1774-86, and in the mean time judge of the court of common pleas, and of the Litchfield co. probate court. In 1775 congress appointed him a commissioner for Indian affairs. The next year he was put in command of the Connecticut forces enlisted to co-operate with the army in New York. The same year he entered congress which he left for the field soon after the promulgation of the declaration of independence, of which he was a signer. He took part in the battle of Saratoga. He still served in congress from time to time till 1783. He was lieutenant governor of Connecticut, 1786-96, and governor from the latter date till his death.

WOLCOTT, OLIVER, LL.D., 1760-1833; b. Conn.; educated at Yale college. He took part in the revolutionary war as an aid to his father, Oliver, and as an officer in the commissary department. He was called to the bar in 1781; was U.S. controller, 1788-89, and auditor of the U.S. treasury, 1789-91. He was again controller, 1791-95, when he became secretary of the treasury. On leaving that office in 1800, he was appointed U.S. circuit judge, which office he held for 2 years. He was a merchant in New York till 1812, when, in association with his brother Frederick, he founded large factories at Wolcottville, near his native town, Litchfield. He was governor of Connecticut, 1818-27, when he returned to New York.

WOLCOTT, ROGER, 1679-1767; b. Windsor, Conn.; commissary of the Connecticut troops in the expedition against Canada in 1711. He served also in the succeeding French wars, and rose to be maj.gen. He was governor of Connecticut, 1761-65, after serving several terms in the legislature, in the council, and on the bench of the county court, and of the superior court. He was also deputy-governor. He was the author of *Poetical Meditations* (1725), and a poem called *A brief Account of the Agency of the Honorable John Winthrop, Esq., in the Court of King Charles II.*

WOLF (corresponds to Lat. *vulpes*, a fox), the name of a wild animal of the same genus with the dog, and of which it is indeed doubtful if it constitutes a distinct species; while, as to the different kinds of wolves found in different parts of the world, it must be deemed at present wholly uncertain whether they are to be regarded as species or varieties, although they have, provisionally, received specific names. There exists among them the same close resemblance as in the different kinds of dog, with a similarly marked distinction of characters, which, however, it is difficult to state as specific characters are generally stated. The same difficulty, therefore, occurs in the natural history of wolves as in that of dogs, although the number of different forms is not so great. In their most important characters, and those which, at least subject to variation, are generally regarded as best marking specific distinction, they agree not only with each other, but with dogs. The opinion, that the wolf is the parent of the dog, or of some of the kinds of dog, is favored by the identity of the period of gestation, a point which seems to be pretty well established, and which, in such a question, is to be regarded as of great importance. Dogs and wolves also intermix, but it is not yet fully ascertained that the offspring will continue fertile among themselves. It is further observed that wild races of dogs, whether originally wild, or having become wild (*feral* races), resemble wolves in many respects, in their dull uniformity of color, in their

lengthened muzzle, lengthened limbs, lank form, and gaunt aspect, and even in the bushiness of the tail. It has been alleged, as a reason against supposing the wolf and the dog to be really of the same species, that the wolf is incapable of domestication and of attachment to man. This, however, is not the case. Both the common wolf of the old world and the wolves of America have been found capable of domestication, when taken young, and instances are on record of their having displayed an attachment to their master like dogs.

The COMMON WOLF (*Canis lupus*) inhabits Europe and the northern parts of Asia, its range extending from the Arctic regions as far s. as the northern parts of Africa and of India. It is of a yellowish or tawny-gray color, with strong coarse hair, which is longest on the ears, neck, shoulders, and haunches, but particularly on the throat; the muzzle is black, the upper lip and chin white. The ears are erect and pointed, the muzzle sharp; the legs rather longer than those of the shepherd's dog; the tail bushy, but not curling; the eyes oblique, giving a peculiar vicious expression to the countenance. The wolf is swift of foot, and hunts deer and other animals, packs of wolves associating for this purpose; it also often commits great ravages among sheep, and attacks calves, but seldom full-grown oxen. It seldom attacks man, unless hard pressed by hunger, when it becomes very dangerous. The hungry wolves which sometimes descend, in severe winters, from the forests of the Alps, Pyrenees, and other mountains, are much dreaded by the inhabitants of neighboring regions; and terrible stories are told of travelers chased by packs of wolves in the forest-covered plains of the e. of Europe and in Spain. In general, the wolf is cowardly and stealthy, approaching sheepfolds and farm-buildings by night, in search of prey, and readily scared by any demonstration of watchfulness, fleeing from dogs, and not readily exposing itself within range of shot. It defends itself, however, with great vigor, when compelled to do so. It is not easily trapped, being extremely cautious, and appearing to understand the nature and purpose of a trap almost as well as those by whom it is set. Wolves have often been known even to approach a trap so skillfully as to devour the bait without harm to themselves, getting at it from below.

Diversities appear in the wolves of different countries of Europe and Asia, but not very considerable. The French wolves are generally browner, and rather smaller, than those of Germany; the wolves of Russia are larger, and have longer hair; the wolves of the Alps are brownish-gray, and not of large size; in Italy and Turkey a tawny color predominates. In some very northern regions, wolves become white in winter; and white wolves, probably albinos, sometimes occur in more southern regions. The black wolf is the most marked European variety. It is found in the Pyrenees and in Spain, and is very large and strong. Strings of mules are often followed by these wolves in the passes of the Pyrenees, after evening comes on, and they not unfrequently succeed, notwithstanding all the care of the muleteers, in capturing some of the animals.

Wolves are still very plentiful in some parts of Europe. In the Pyrenees and Ardennes, among the Carpathian mountains, in Turkey and the principalities, they are common; and in the vast forests of Poland and Russia wolves often appear in formidable packs, and still cause much loss by their attacks on cattle, sheep, and horses. As culture increases, wolves become scarce. The wolf was formerly common in Britain, and the Anglo-Saxon name for January, *woolf-month*, is significant of this fact. Places of refuge from wolves were erected for travelers in wild and unpeopled districts, as at Flixton in Yorkshire. King Edgar commuted the punishment of criminals on their producing a certain number of wolves' tongues. Lands in Derbyshire were held on condition of killing wolves. It is not easy to say at what date wolves ceased to exist in England; it was probably about the end of the 15th c., but they continued to commit serious ravages on flocks, in Scotland, in the end of the 16th c., and the last wolf in Scotland is said to have been killed by sir Ewen Cameron of Lochiel, in 1680. They existed in Ireland at least as late as 1710.

The American wolves are very similar to those of the old world. They have been described as forming several distinct species, but are by some included in one, doubtfully distinguished from the common wolf, and to which the name *canis occidentalis* is given. The fur is thicker, and the form more robust than in the common wolf, the muzzle is less pointed, and the profile not so straight, the legs and ears are shorter, and the tail is more bushy. The GRAY WOLF (*canis occidentalis*, var. *griseo-albus*, or *C. griseus*) is abundant in the northern parts of North America, except in the long-settled districts, from which it has been expelled by man. It is the only kind found in Canada. A few still remain in the mountainous and wooded parts of New England. Packs of wolves hang around the herds of buffaloes (bisons) on the western prairies, not daring to attack strong animals, but ready to seize any sickly straggler that falls behind the rest. They hunt and run down deer. The gray wolf equals the European species in cunning, and has been known to bite off the cord close to the trigger of a set gun, and afterward to devour in safety the bait placed before the muzzle. It has also been known to haul up fishing-lines set in a hole of the ice, and to help itself to the fish. It is frequently taken by means of pit-falls. On the prairies, the Indians kill great numbers of wolves by inclosing them in a circle gradually reduced, but originally extending over many miles. A premium of 10 to 20 dollars a head was formerly paid, in some parts of America, for the destruction of wolves, partly by the state, and partly by the county or

town, because of their ravages among sheep. The range of the gray wolf extends to the coldest northern regions, as Melville Island and Banks's Land. In the north-western states, the gray wolf gives place to the **DUSKY WOLF** (*canis nubilus* of many naturalists); and in the s. is the **BLACK WOLF** (*C. ater* or *lycaon*); while on the upper parts of the Missouri, the **WHITE WOLF** appears, and the **RUFEOUS WOLF** in Texas. They differ little in characters and habits from the gray wolf.—The **PRAIRIE WOLF** (*C. latrans* or *lycaeus latrans*), the **COYOTE** of the Mexicans, is a very different animal, more resembling the jackal. It is found from Mexico northward to the Saskatchewan, abounding on the vast plains of the Missouri. It is 36 to 40 in. long, with a tail of 16 or 18 in., the muzzle sharp and fox-like, the ears very large and erect, four toes on each foot, and on the fore-foot a sharp claw on the inside, 2 in. above the ground, attached to the rudimentary thumb; the color is usually dull yellowish gray, with black cloudings, the under parts dirty white. It hunts in packs. It is an extremely fleet quadruped, excelling every other in the countries which it inhabits, except the prong-horn. Its voice is a kind of snapping bark. The true wolves never bark, the only sound they emit being a prolonged and dismal howl.

South America has numerous species of *canida*, some of which are known as *Aguana* wolves, and are nearly allied to the prairie wolf.

WOLF, FREDERICK AUG., the most gifted classical scholar and first critic of his age, was born Feb. 15, 1759, at Haynrode, near Nordhausen. He was brought up and educated with great strictness by his father, the leader of the choir and organist of the place; but was afterward sent to the gymnasium at Nordhausen. Here, under the training of the rector Hake, were developed in him not only that restless ardor for the thorough study of the ancient languages which actuated him throughout life, but also, what was afterward the predominating trait of his character, the habit of inquiring and judging for himself, and of pursuing only one object at a time. Before leaving the gymnasium for the university, he had read the principal ancient authors, as well as the French, Italian, Spanish, and English; and had also perfected himself in the theory and practice of music. At the university of Göttingen, which he went to in 1777, with the intention of studying philology exclusively, he attended the lectures very irregularly, being already much given to private study. For the rest, he lived very retired, was little visited or known, and was only intimate with a few. However, he gave lessons to several students in Greek and also in English, for which he published Shakespeare's *Macbeth*, with explanatory notes (Gött. 1778). From Heyne (q.v.), who had once excluded him from hearing a course of lectures on Pindar, on account of the irregularity above noticed, he kept himself quite aloof. In order, however, to commend himself to a man who had so much influence as Heyne had, he laid before him, shortly before his departure in 1779, a dissertation, containing some novel views regarding the Homeric poems; which, however, Heyne coldly returned. In the same year, he went as teacher to the pedagogium at Hfeld, and there first established his fame by an edition of the *Symposium* of Plato, with notes and introduction in German. In 1782, he was appointed to the rectorship of the high school at Osterode, in the Harz; and, in 1783, accepted an invitation to Halle, as professor of philosophy and of pedagogical science. In Halle, Wolf had at first difficulties to encounter, as he rather estranged than attracted students by the high tone of his teaching. However, he soon learned to adapt himself to his audience, and then the crowd of eager pupils was very great. As academical teacher, he went on the principle that classical antiquity should be looked upon chiefly as serving for a model of what is noblest and greatest in public and private life, and as such, is to be employed as a medium of education. He made it the principal duty of his office to provide able teachers and superintendents for the schools of his native country, and to deliver education, as much as possible, from the scientific pedantry of the old school of pedagogues. Literary labors and fame he looked upon more as a subordinate object; and his effectiveness as a teacher was unparalleled during the twenty-three years he lived at Halle. He nevertheless established his reputation as a scholar and critic by an edition of Demosthenes's *Oratio adversus Leptinem* (1789), which attracted much attention, and still more by his celebrated *Prolegomena ad Homerum* (1795), in which he unfolded, with prodigious learning and acuteness, his bold theory, that the *Odyssey* and *Iliad* are composed of numerous ballads or rhapsodies by different minstrels, strung together in a kind of unity by subsequent editors (see HOMER). This work made a great sensation through the whole of Europe. Some scholars gave out that they had long entertained similar notions regarding the Homeric poems; and Heyne insinuated that the *Prolegomena* were only a reproduction of what Wolf had heard at Göttingen. This gave rise to the spirited *Briefe an Heyne* (Letters to Heyne, Berl., 1797), of which the first three may be considered as models of scholarly polemic and fine irony. Some years afterward Wolf published the text of the four orations of Cicero, whose genuineness had been called in question by Markland in England, namely—*Post reditum in Senatu*, *Ad Quirites post reditum*, *Pro domo sua ad pontifices*, *De haruspicium responsis*—appending the previous controversy, and adding striking observations of his own in proof of their spuriousness. He next went still further, and attacked the authenticity of the oration *Pro Marcello*, which had long been studied by the Ciceronians as a model of eloquence and style, pronouncing it to be mere inflated declamation, in a diction hardly Latin, and which Cicero

never could have written. This audacious skepticism produced no little alarm. After having refused a call in 1796 to Leyden, in 1798 to Copenhagen, and 1805 to Munich, his position was considerably improved, and he received the title of privy-councillor. After the disasters of 1806, the university at Halle was dispersed, and Wolf was for a time reduced to great straits. However, he soon found a suitable position as member of the academy of sciences at Berlin, where he took an active part in the re-organization of the university, and became a professor. He was taken into the ministry of the interior as a member of the section for public instruction; but, finding that the duties interfered with his time and strength for teaching, which he considered his mission, he continued only a short time in public office. He next gave up the work of an ordinary professor, and reserved at last only the privilege of lecturing in the university on such subjects as he chose. For the benefit of his health, he took a journey to the s. of France in April, 1824, and died at Marseille, Aug. 8, 1824. The multitudinous works of Wolf we cannot attempt to enumerate. They consist chiefly of critical editions of classical writings, with dissertations and annotations, and often with admirable translations either in German or Latin. While in Berlin he edited, along with Buttmann, the *Museum der Alterthumswissenschaften* (1807-10), and afterward the *Literarische Anzeiger* (1817-20), which has been pronounced perhaps the best philological journal that has ever been published, and which contains, among other papers by Wolf, a long notice of Richard Bentley. From the papers which he left, his son-in-law, Körte, published *Ideen über Erziehung, Schule und Universität* (Ideas on Education, School, and University; Quellinb., 1835).—See Hanhart, *Erinnerungen an Fr. Aug. W.* (Bas. 1825; Körte, *Leben und studien Fr. Aug. W.'s des Philologen* (2 vols., Essen., 1835); Gottholdt, *Fr. Aug. W. die Philologen und die Gymnasien* (Königsb., 1843).

WOLF, JOHANN CHRISTIAN VON, a celebrated philosopher and mathematician, was b. in 1679, at Breslau. His father, a rather poor but well-informed artisan, made it his chief object to give a good education to his son, who at an early age showed excellent abilities. Wolf received the elements of his education at the gymnasium of Breslau, and went to Jena in 1699 to study theology. However, mathematics and philosophy were his favorite sciences, and to them he almost exclusively devoted himself. In particular, he studied Descartes and Tschirnhausen's writings, to whose *Medicina mentis* he wrote annotations, which brought him into connection with Leibnitz. In 1703 he delivered at Leipsic a graduation disputation, *De Philosophia Practica Universalis, Methodo Mathematica Conscripita*, which made a very favorable impression, and then began to give lectures in mathematics and philosophy, which were very numerous attended. By various works which he published on special branches of mathematics, his name became celebrated even in foreign countries. When the incursion of Charles XII. into Saxony obliged him to leave Leipsic, he received, on the recommendation of Leibnitz, a call to Halle, as professor of mathematics and natural philosophy. He there acquired great celebrity by his systematical method of teaching, as well as by numerous mathematical writings. The clearness and definiteness of the ideas and propositions which he exhibited in his mathematical lectures, were something till then quite unknown. Hence it came that his system of metaphysical and moral philosophy, which he worked out according to this mathematical method, and published, met with universal approbation, and quickly spread through Germany: it became a kind of rage to treat all sorts of subjects in the mathematical method, the effect of which was often ludicrously pedantic. Wolf, however, was violently attacked by his colleagues in Halle, especially by those theologians who favored the pietism then coming into vogue: he was declared to be a despoiser of religion, and a teacher of error; and a formal accusation was brought against him to the government. The immediate ground of the accusation was his oration *De Philosophia Sinensium Morali*, in which he spoke with approval of the morality of Confucius, besides which the basest insinuations were brought against him, derived from his doctrine of freedom, which, it was said, encouraged social anarchy. By a cabinet order of Frederick William I., of date Nov. 15, 1723, Wolf was deposed from his office, and was commanded, under pain of death, to quit Halle in 24 hours, and the Prussian dominions in two days. He did so on Nov. 23, and met with a favorable reception in Cassel, and was appointed to a chair in the university of Marburg. The dispute about his philosophical system now became general, and nearly the whole of Germany took part either for or against him. At the same time he received from abroad many marks of honor and advantageous proposals, which last, however, he declined. In the mean time, the Prussian government had begun to regret the steps it had been led to take against him, and had appointed a commission to re-examine the matter. This resulted in his entire justification; and when Frederick II., who had a great esteem for him, and had studied his system, ascended the throne (1740), Wolf was induced to return to Halle as professor of the law of nature and nations, and with the titles of privy-councillor and vice-chancellor. In 1743 he became chancellor in the place of Ludwig, and was raised to the rank of baron of the empire by the elector of Bavaria during the regency. Wolf died in 1754. Before his death he saw his philosophy spread over the whole of Germany and a great part of Europe; he had, however, outlived his reputation as an academical teacher. That he did great service to philosophy, cannot be denied. If he did not enrich it by great and brilliant dis-

coveries, he at least directed attention to systematic method; and by treating scientific subjects in the mother tongue, he did much to create that wide-spread taste for philosophical speculation which has since been characteristic of Germany. Wolf adopted Leibnitz's hypotheses and principles, which he endeavored to carry out into a complete system and popularize. But although the Wolfian philosophy was a great improvement on the scholastic Aristotelianism that had previously prevailed, its dogmatism could not stand the criticism of Kant, and it is now a theory of the past. By his voluminous writings, partly in the German language, and the immense number of his pupils, Wolf had a wide and beneficial influence on his age, more especially as counteracting pietism and mysticism, then rampant. He also did good service to the German language. The multitude and extent of his writings is truly marvelous, even if we look at nothing else than the mechanical labor of writing them. He treated mathematics and philosophy in double set of works; the one in full in Latin, the other shorter as German school-books, of the most of which several editions have been published. Besides these, are a great number of treatises on single subjects in physics, mathematics and philosophy. His systematic works on all the chief branches of philosophy alone amount to 22 vols. in quarto.—See *Christian Wolf's eigene Lebensbeschreibung* (Christian Wolf's Autobiography), published by Wutke (Leip., 1841); Ludovici, *Sammlung und Auszüge der Sämmtlichen Streitschriften wegen der Wolf'schen Philosophie, u. s. w.* (Collection and Extracts of the Controversies about the Wolfian Philosophy, etc., 2 vols., Leip., 1737); by the same author, *Aufführlicher Entwurf einer vollständigen Historie der Wolf'schen Philosophie* (3 vols., Leip., 1737).

WOLF-DOG, a kind of dog used for hunting the wolf, formerly abundant in Norway and Sweden, but now almost exclusively found in Spain, into which it is supposed to have been introduced by the Goths. It is of the same group with the shepherd's dog; and is of a large size, little inferior to the mastiff, with pointed nose, erect ears, long silky hair, and a very bushy tail curled over the back. In color it is mostly white, with large clouds of tawny color or brown.

WOLFE, a co. in e. Kentucky, drained by the Kentucky and Red rivers; 270 sq.m.; pop. '80, 3,983—3,982 of American birth, 28 colored. Co. seat, Campton.

WOLFE, a co. in s.w. Quebec, dominion of Canada, drained by St. Francis river and other streams; 265 sq.m.; pop. '71, 8,823. Co. seat, Dudswell.

WOLFE. The Rev. CHARLES, the son of a county gentleman of Kildare, was b. Dec. 14, 1791, at Dublin. The family having come to England on the death of his father, which took place while he was yet quite young, the boy received his chief education at Winchester, where he showed himself an apt scholar. Being transferred in 1809 to the university of Dublin, he succeeded in securing a scholarship, and in 1814 his degree of bachelor of arts. During this period he was actively employed as a tutor: at this time it was also that he composed the greater part of the poetry which he left as his legacy to the world. In 1817 his celebrated lines on *The Burial of Sir John Moore* suggested by reading Southey's impressive account of it in the *Edinburgh Annual Register*, were written; and soon after they found their way into the newspapers. So generally admired were they that even while the name of their author remained unknown, they had won for themselves a secure place in the memory of the British people. As a singularly felicitous and touching poetical record of a noble and pathetic incident in our national history, they are, perhaps, not likely to be forgotten while that history is patriotically read and remembered. Wolfe, after qualifying himself to take orders, became, in 1817, curate of Ballyclog, in the county of Tyrone, from which he was shortly transferred to the larger parish of Donoughmore. His devotion to his duties was extreme, and was repaid by the warm affection of all with whom they brought him in contact. But they seem somewhat to have overtaxed the strength of a constitution at no time robust; symptoms of consumption appeared; and a visit which he made to Edinburgh in May, 1821, developed it. He tried in search of health, successively, England, the s. of France, and finally the sheltered Cove of Cork, in which last place he died on Feb. 21, 1823.

His literary *Remains*, consisting of sermons chiefly and poems, were given to the world, with a Memoir, in 1825, by the rev. John A. Russell, M.A., archdeacon of Clogher, an attached friend of the deceased. The work, though containing some poetry of real merit, never made any great impression, and is now quite forgotten. The one beautiful piece which preserves for us the name of Wolfe, was attributed by guess, while he lived, to more than one of the most famous writers of the day—as, notably, Campbell and Byron. Since his death, several nefarious attempts have been made to filch from him the fame he continues to derive from it.

WOLFE, JAMES, the most famous English gen. of his time, was b. at Westerham, in Kent, on Jan. 2, 1727. His father was a lieut.col, afterward gen. Wolfe, an officer of merit and distinction, who served under Marlborough and prince Eugene. Along with his brother Edward, who was about a year younger, James received his first education at a small school in that neighborhood. From the first, the boy had resolved to follow his father's profession of arms; and when little more than 13 years old, he started to accompany the col. as a volunteer in the unfortunate Carthage expedition. An attack of illness, however, made it necessary to put him ashore at Portsmouth just before

the fleet sailed. In 1742 he received his commission as ensign in the 12th, or col. DuRoure's regiment of foot, with which he was soon after embarked for service in Flanders. In the year following he took part in the famous battle of Dettingen; and it is evidence of the capacity he already began to display, that we find him, though still the merest boy, acting in the responsible capacity of ajt. of his regiment. After the battle of Fontenoy in 1745—at which Wolfe, who had now become a capt. in the 4th, or Barrell's regiment of foot, was, notwithstanding a current tradition to that effect, certainly not present—the British troops were withdrawn from Flanders to assist in the suppression of the rebellion at home. With the army in Scotland he served in the capacity of brigade-maj., and was present at the battles of Falkirk and Culloden. In 1747 he was again abroad on service. At the battle of Laufeldt he was wounded, though not seriously; and his conduct was so distinguished that he was publicly thanked by his commander-in-chief, the duke of Cumberland. In the beginning of the year 1749 he was appointed maj. of the 20th foot, then stationed at Stirling, whither he proceeded. In the absence of the col., the command of the regiment devolved upon him. In this responsible position, which was rendered much more trying by the disaffection still prevalent, young as he was, Wolfe conducted himself with admirable tact and discretion. With little interruption, he remained in Scotland till the end of 1753, when the regiment returned to England. From the tone of his correspondence, it is evident he was not greatly delighted with Scotland or its inhabitants. In the mismanaged expedition against Rochefort in 1757, Wolfe was appointed to act as quartermaster-gen. of the force. The total failure of the operations brought disgrace to nearly all concerned; but it became sufficiently known that, had Wolfe's prompt and daring counsels been followed, the result would have almost certainly been different; and his reputation, already a brilliant one, rose considerably in consequence. In particular, it appears that the attention of Pitt was now first decisively drawn to him as an officer of whom, in any enterprise intrusted to him, great things might be expected. As marking approval of his conduct, the full rank of col. was conferred on him. The high opinion thus formed of him, was signally confirmed the year following, when he was intrusted with the command of a brigade in the expedition against cape Breton, under gen. Amherst. A great success was obtained in the capture of Louisburg; that it was mainly due to Wolfe's skill, boldness, and activity was quite clearly understood, and he became popularly known as "the hero of Louisburg." Presently came the opportunity which was to consummate his glory, in the instant of heroic death. Pitt was now organizing his grand scheme for the expulsion of the French from Canada; it was his just boast that he "sought for merit wherever it was to be found;" and the expedition, which had for its object the capture of Quebec, the enemy's capital, he confided to the care of Wolfe, allowing him, as far as possible, a *carte blanche* for the choice of his subordinate officers. On Feb. 17, 1759, Wolfe, advanced to the rank of maj.gen., and commanding an army of between 8,000 and 9,000 men, set sail from England. At Louisburg he had news of the death of his father, the state of whose health had for some time been such as to prepare him for the event. On June 26 Wolfe landed his forces on the isle of Orleans, opposite Quebec, and proceeded to concert his plans for the attack upon it. This, of which he had shortly before written as likely to be found "a very nice operation," proved, on a closer examination, to be one of stupendous, and, indeed, nearly hopeless difficulty. The system of defense adopted by his adversary, the skillful and wary Montcalm, was such as to offer him no point of advantage. In all his attempts, though seconded most ably by admiral Saunders, who commanded the fleet, he found himself completely foiled. The season wore fast away during which operations could be continued; and an abortive result seemed imminent of the expedition from which so much had been hoped. But at last, at day-dawn of Sept. 13, he found himself at the head of his little army on the heights of Abraham, above the city, where Montcalm, sorely against his will, was forced to risk decision of the struggle by battle in the open field. Resolving to stake all on a final effort, Wolfe had, during the night, succeeded in scaling the cliffs at a point insufficiently guarded—an operation of such frightful risk and difficulty as in war has scarcely a parallel. Of victory he had no doubt; his little force now—exclusive of detachments necessarily left behind—reduced to something like 5,000 men, was indeed opposed to near 8,000 of the enemy, besides Indian auxiliaries; but of these it was well known that only a part could be depended on as trained and veteran troops. The result justified his confidence; after a short struggle, the enemy was driven from the field in complete rout; the capitulation of Quebec followed some days after; and its fall decided the fate of Canada. But Wolfe did not live to reap the fruits of his victory; he died in its very hour. In person he led the right; twice wounded, he refused to leave the front; a third bullet prostrated him; and he was carried, plainly dying, to the rear. He lived only long enough to know that the battle was decisively won; then, rallying his last strength to give one final order, and saying: "Now God be praised! I die in peace," he expired. The gallant Montcalm also fell, paying, with almost his last breath, the tribute of a true soldier to the valor of the troops who had beaten him: "Since," said he, "it is my misfortune to be discomfited and mortally wounded, it is a great consolation to me to have been vanquished by so brave an enemy. If I could survive, I would engage to beat three times the number of such forces as mine were, with a third of British troops."

The news of the victory was received in England with a tumult of exultation, dashed with grief for the loss of the hero to whom the nation owed it. When parliament met in November, the house of commons addressed the king, praying that his majesty would order a monument to be erected to the memory of the dead soldier in Westminster abbey; where, accordingly, an *effigies* of him may be seen, with allegorical adjuncts as tasteless and absurd as usual. He was buried beside his father, in the family vault under the parish church at Greenwich.

A single military achievement, however brilliant, cannot be made ground of a claim for the successful soldier to take rank as a great capt. But that Wolfe had the true genius for command, which needed only time and further opportunity to win for him a fame still more splendid, it is scarcely permitted us to doubt. Through the lower regimental grades he rose rapidly by sheer force of personal merit, at a time when the service was a mere hotbed of corruption; and on attaining to higher commands, he in every instance gave evidence of the higher military qualities which proved him eminently worthy of them. He had only reached the age of 33, when in his last, and properly his one great achievement, he died, seemingly cut off in the mere opening of a brilliant career. He was of warm affections and frank and generous nature; though his temper was somewhat eager, impulsive, and irascible, few men have ever been more generally beloved; and not many men so famous have left behind them a memory in every way so pure and spotless.

Till lately, no memoir of him in the least adequate existed; but in *The Life of Major-general James Wolfe—founded on Original Documents, and illustrated by his Correspondence*, by Robert Wright (Lond. Chapman and Hall, 1864), the want is now competently supplied.

WOLFENBÜTTEL, a very old t. of Brunswick, stands in a low marshy district on both banks of the Oker, 7 m. s. of Brunswick by railway. Its old fortifications have been converted into promenades. There are several churches, schools, charities, and a college. In a handsome building formed after the model of the pantheon at Rome, is the famous library placed here in 1644, of which Lessing was sometime librarian. It consists of nearly 27,000 volumes, and upward of 10,000 manuscripts, and contains some of the finest missals in Europe, an immense collection of Bibles, including Luther's Bible with autograph notes. In the same institution are preserved the great reformer's marriage-ring, spoon, drinking-glass, and portrait by Cranach. The cultivation of vegetables is carried on to a great extent, and there are manufactures of lacquered and japanned wares, paper-hangings, leather, tobacco, and liqueurs; a trade in corn, cattle, and lin yarn. Wolfenbüttele has five annual fairs. Pop. '75, 11,105.

WOLFENBÜTTEL FRAGMENTS. See LESSING; REIMARUS.

WOLFF, ALBERT, b. Germany, 1814; studied sculpture there and in Italy. He was appointed professor in the Berlin academy of fine arts in 1836. Among his works, which are noted for their severe taste, are the statues of Frederick William III. at Berlin, and of Galileo at the university of Pesth.

WOLFF, EMIL, b. Berlin, 1802; studied sculpture with his uncle Schudow, and at Rome. He has been professor in the Berlin academy of fine arts. His *genre* statues and those on mythological or classical subjects are among his best works. Among his best busts are those of Bunsen, and of Thorwaldsen.

WOLFF, JOSEPH, D.D., LL.D., 1795-1862; b. Weilersbach, Germany; was the son of a rabbi; early became a Christian; taught Hebrew at Frankfurt; studied at Munich, Weimar, and Vienna; became a Roman Catholic at Rome, 1815, but was expelled for heresy, 1817; went to England, united with the church of England; studied two years at Cambridge, embarked as missionary to the Jews, 1821; traveled in the east; returned to England, 1826, by way of the Crimea and Circassia; married a daughter of the earl of Oxford, 1827; embarked on another missionary tour, leaving his wife in Malta; was taken prisoner and sold as a slave, but escaped to Bokhara, laboring 3 months there among the Jews; started for India, passing through Afghanistan and Cashmere, reaching Calcutta, 1833; visited the Jews at Cochin and Goa; spent some time in Abyssinia; returned to England *via* Malta, 1834; visited Abyssinia again, 1836, and the Reclabates of Yemen; sailed from Bombay for New York, 1837; preached in the principal cities of the United States; returned to England, 1838; was curate at Smithwaite; went in 1843 to Bokhara to effect the release from imprisonment of col. Stoddart and capt. Conolly; was himself made a prisoner and condemned to death, but escaped through the interference of the Persian ambassador; reached England, 1845. He published *Journal of Missionary Labors; Mission to Bokhara*.

WOLFF, WILHELM, b. Brandenburg, 1816. He is a sculptor of merit, his best work being representations of animal life. Among his best known works are "The Lion's Ride," a buffalo fighting with wolf dogs, and a buccante sporting with a panther. Wolff has also produced busts of Joachim II., Herder, and Bach.

WOLFFIAN BODIES, important organs in the vertebrate embryo, in which they serve only a temporary purpose, except in the lowest class (the fishes), where they remain permanently. In the development of the chick, these bodies may be seen as early as the fourth day, lying along either side of the vertebral canal, from the region of the heart

downward and backward, and consisting of a series of cœcal or blind appendages, corresponding with the so-called kidneys of fishes, which in reality are true persistent Wolffian bodies. On the fifth day, the appendages become convoluted, and the body which they collectively form increases in mass. The appendages are then seen to possess a secreting property, and the fluid which they secrete is conveyed by the duct of each side into the *allantois*, a sac which, at the same time, acts as a temporary respiratory organ, and is also used as a urinary bladder. Hence these organs may be regarded in the light of temporary kidneys. In the chick, the true kidneys begin to form from the Wolffian bodies at the fifth or sixth day, and gradually increase in size as the temporary organs diminish; and at the end of fetal life, only a shrunken rudiment of them can be observed. In man, the process is very similar, the Wolffian bodies beginning to appear toward the end of the first month; while in the seventh week, the true kidneys first present themselves. From the beginning of the third month, the Wolffian bodies begin to decrease, the kidneys increasing in a corresponding ratio, and at the time of birth, scarcely any traces of the former can be seen. It was formerly believed that the essential parts of the generative apparatus—the testes in the male and the ovaria in the female—were also developed from these bodies; but this is not the case, as they have an independent origin in a special mass of blastema peculiar to themselves, in the immediate vicinity of the Wolffian bodies.—See Carpenter's *Principles of Human Physiology*.

WOLFFIAN BOTTLES, the name given to a set of apparatus employed for the distillation of hydrochloric acid (q.v.). It consists of a retort, in which chloride of sodium (common salt) is submitted to the action of sulphuric acid, gradually added through a funnel and the vapor evolved passes out into the first bottle and is absorbed by water. This process continues till the power of absorption of the water in the first bottle ceases (or, in other words, till the water becomes *saturated*), when the vapor collects in the neck of the retort and in the tube leading to the first bottle, till it acquires sufficient tension to force its way through the water, and enter the second bottle by a tube. In turn, the water in the second bottle becomes saturated, after which the gas is forced to find its way into the third bottle through the other two by means of the connecting tube. After the force of reaction in the retort has become weakened, the evolution of the gas is quickened by the application of a flame, which requires to be gradually increased. Considerable heat being generated during absorption, it is desirable that the bottles should be immersed in cold water. A third tube entering each bottle, except the last, admits atmospheric air to prevent the rarefaction in the retort tending to force the contents of the bottles back into it.

WOLF-FISH, *Anarrhichas*, a genus of fishes of the family *blenniidae* (see *BLENNY*), having no ventral fins, the pectorals very large, a single dorsal fin extending from behind the head almost to the tail-fin, a long anal fin, the tail-fin rounded; the head round, smooth, and blunt: the teeth large and strong, not attached immediately to the jaws; but to bony processes connected with them by sutures. The jaws are powerful, the front teeth resemble the canine teeth of mammals, while the vomer and palate are furnished with teeth which have the form of rounded tubercles. One species, the **COMMON WOLF-FISH**, also **CAT-FISH** and **SEA-CAT** (*A. lupus*), is found on the coasts of Britain, and is plentiful in more northern seas. It is frequent on the coasts of Scotland, particularly in the n., but is more rare on the English coasts. It is of a light gray color, brownish on the back; the lower parts exhibiting ten or twelve dark transverse stripes. The skin is covered with much slime. It attains the length of 6 ft., and is a creature of formidable and even repulsive appearance: it bites savagely when caught, and fishermen therefore generally dispatch it as soon as possible by knocking it on the head. It preys chiefly on mollusks and crustaceans, which its jaws easily crush. It is often very destructive to nets, being an active and powerful fish. Notwithstanding its ugliness, it is in esteem for the table, and it is often brought to the Edinburgh market. It is much used in Iceland, both fresh and salted; and a kind of shagreen, used for bags and pouches, is made of its thick skin. A very similar species, *A. vomerius*, is found on the American coast from New York to Greenland, and is not only used fresh, but also split, salted, and smoked.

WOLF RAM is a native compound of tungstate of iron and manganese, from which the metal tungsten (q.v.) is usually obtained.

WOLF'S-BANE. See *ACONITE*.

WOLGAST, a commercial t. and sea-port of Prussia, in Pomerania, stands on the Peene, about 10 m. from its entrance into the Baltic, and 33 m. s.e. of Stralsund. The shallowness of the water admits only the smaller class of sea-going vessels entering the harbor. There is a public dockyard and a school of navigation; and the inhabitants, who number (1875) 7,269, are occupied in ship-building, seafaring, and in the manufacture of candles, soap, and tobacco. The larger ships discharge and take in cargoes at Ruden, a small island and pilot-station opposite the mouth of the Peene, known as the landing-place of Gustavus Adolphus in 1630. Wolgast is a very old town; it was strongly fortified as early as the 12th c., and was once the residence of the dukes of Pommern-Wolgast; it was taken and retaken five times between 1628 and 1675; the Russians plundered and burned it in 1713, and the Swedes retook it in 1715.

WOLLASTON, WILLIAM HYDE, M.D., a distinguished physicist, was the second son of the rev. Francis Wollaston, of Chiselhurst, in Kent, and was born Aug. 6, 1766. After the usual preliminary education, he was entered of Caius college, Cambridge, where he studied for the medical profession, and took the degree of M.D. in 1793, in which year, also, he was elected a fellow of the royal society. After practicing as a physician at Bury St. Edmunds, he removed to London; but being beaten by Dr. Pemberton in a competition for the post of physician to St. George's hospital, he determined thenceforth never to write a prescription, "were it for his own father," but to devote himself wholly to scientific investigation. This sudden resolution proved ultimately most beneficial, leading him rapidly to wealth and fame; for unlike many eminent investigators of nature's laws and phenomena, Wollaston combined "the genius of the philosopher with the skill of the artist," and succeeded in making industrial application of several of his important discoveries. His researches were prosecuted over a wide field, but were pre-eminently fruitful in the sciences of chemistry and optics. To the facts of the former science he added the discovery of new compounds connected with the production of gouty and urinary concretions, such as phosphate of lime, ammonio-magnesian phosphate (a mixture of these two forming the "fusible" calculus), oxalate of lime, and cystic oxide; also the discovery in the ore of platinum of two new metals, palladium (1804) and rhodium (1805). By his ingenious discovery of a mode for making platinum malleable, he is said to have gained £30,000, and his mode of hardening steel, and some other discoveries of a practically useful nature, were also very lucrative. His contributions to optics were the celebrated "goniometer" (q.v.), a most valuable gift to mineralogists; an apparatus for ascertaining the refractive power of solid bodies; the "camera lucida" (q.v.); the discovery of invisible rays outside the violet band of the spectrum; and an immensity of valuable and interesting observations on single and double refraction. He did much to establish the theory of definite proportions. To other sciences his contributions were also of importance, for he was the first to demonstrate the identity of galvanism and common electricity, and explain the cause of the difference in the phenomena exhibited by each, etc. Wollaston was elected secretary of the royal society, Nov. 30, 1806. He died of effusion of blood on the brain on Dec. 22 of the same year. His most important memoirs, 38 in number, will be found in the *Philosophical Transactions* (1800-29).

WOLSELEY, Sir GARNET JOSEPH, was born near Dublin, June 4, 1833. He entered the army in 1852, and since then has been constantly engaged in the service of his country, and has steadily risen to greater eminence in his profession. He served in the Burmese war of 1852-3; he was severely wounded in the Crimea, and received the cross of the legion of honor for his bravery there. He was in India during the mutiny, and in the Chinese war of 1860. Next year he went to Canada, and in 1870 successfully managed the Red river difficulty. On the outbreak of the Ashantee war, Wolseley, now knight commander of the order of Saints Michael and George, was appointed to the command; and on his return received the thanks of parliament and a grant of £25,000 for the "courage, energy, and perseverance" he had displayed in the conduct of the expedition. In 1875, become a maj.gen., he was dispatched to Natal to superintend the affairs of the colony; in 1876 was nominated a member of the Indian council. In 1878 he was made high commissioner and commander-in-chief in Cyprus, from which post he was recalled in 1879 in order to proceed to the seat of the Zulu war, with supreme civil and military command in Natal, the Transvaal, and adjacent disturbed territories. He arrived just before the power of the Zulu king was broken at Ulundi, and arranged the terms of peace with the Zulu chiefs. Wolseley is the author of the novel *Marley Castle* (1877), and of several essays and military handbooks.

WOLLSTONECRAFT, MARY. SEE GODWIN, WILLIAM.

WOLSEY, THOMAS, cardinal, was born in 1471 at Ipswich, in the county of Suffolk, and is reputed to have been the son of a butcher of that place. Though thus of humble origin, it is certain that by some means a good education was secured him, and at an unusually early age, he was sent to Magdalen college, Oxford, of which he became a fellow. It is said that while at Oxford, he was brought into somewhat intimate relations with the great Erasmus, unquestionably then in England. He afterward acted as tutor to the sons of the marquis of Dorset, through whose favor he became in 1500, rector of Lymington, in Somersetshire. On one occasion he appears to have got himself into difficulties. At a fair in the neighborhood, it was his misfortune one day, it is said, to be found drunk and disorderly; and by a certain knight of the shire, by name sir Amias Poulet, he was put in the stocks for the misdemeanor. That he figured in the stocks is certain; that he did so on the score of drunkenness there is no adequate evidence. When the power to retaliate came to him, he took his revenge on sir Amias by having him imprisoned for six years.

Wolsey, who was plainly one of the most insinuating of men in Somersetshire, became intimate with a sir John Nafant, a man of considerable mark. Through the influence at court of this gentleman, he was appointed chaplain to Henry VII., with whom he speedily ingratiated himself. Being sent by the king on a special embassy to the continent, he acquitted himself so dexterously, that he rose still higher in favor; and in 1508 the deanery of Lincoln was conferred on him. The year after, Henry VIII. succeeded

to the throne left vacant by the death of his father. Nearly from this time forward, the life of Wolsey, previously noted, indeed, as a rising man, yet of no special public importance, is in effect the history of the England of which he implicitly became the ruler. From Henry he enjoyed the most unbounded favor and confidence; and the influence which he thus exerted in the conduct of affairs was such as has seldom been exerted by a subject. The most valuable ecclesiastical preferments were showered upon him; and finally, in the same year (1514), he obtained the bishopric of Lincoln and the archbishopric of York. The year following the dignity of cardinal was conferred on him by the pope, who, not long after, appointed him also legate. Besides these ecclesiastical honors, he was made by the king, in 1515, his prime-minister, and lord high-chancellor of England. From this time, up to that of his forfeiture of the royal favor, Wolsey was one of the most important men in Europe; and at home his power was almost without limit. The revenues derived from his various offices were of princely magnitude; and they were further enlarged by subsidies from foreign potentates, eager to conciliate his favor. He did not bear his honors meekly; in his way of life he affected a sumptuous magnificence, and a state only not royal, while in bearing he was arrogant and imperious. He openly aspired to be pope; and there seemed more than once ground for supposing that this crowning object of his ambition was really within his reach. He was, however, disappointed; and it has been surmised that his resentment against Charles V., to whom he attributed his failure, determined, to a considerable extent, the foreign policy of the country.

Such a man could not fail to have many enemies, eager, as occasion might offer, to discredit him with his royal master; and an occasion at length came, of which they did not fail to take advantage. To the project on which the king had set his heart, of divorcing queen Catherine, and marrying Anne Boleyn, Wolsey showed himself hostile; of the latter part of the scheme he was known to disapprove; and his negotiations with a view to securing the consent of the pope to the divorce were conducted, as it seemed to the king, in a dilatory and half-hearted manner. Henry, where his passions were interested, could little brook contumacy of this kind; his displeasure was carefully fanned, and the disgrace of Wolsey was accomplished. In 1529 he was stripped of all his honors, and driven with ignominy from the court. Symptoms of relenting showed themselves, however, next year in the mind of the monarch, and it seemed as if Wolsey might again be taken into favor. The prospect, as it proved, was delusive. Being at the time in Yorkshire, the archbishopric having been restored to him, along with others of his minor preferments, he was arrested on a charge of high treason, and ordered to be conveyed to London for trial. On his journey he was attacked with dysentery, and at the monastery of Leicester, in Nov. 1530, he died.

The faults of Wolsey's character are obvious; but if his pride, ambition, and rapacity were inordinate, his luxury and ostentation somewhat unbeseeming a successor of the primitive apostles, he was not without redeeming qualities. Haughty and insolent to his enemies, and those whose claims ran counter to his own, to his dependents and inferiors he was generous, affable, and humane; and not a few of them showed their honorable sense of this by devotion to him in his misfortunes. Of learning he was a most liberal and enlightened patron; and the endowment of Christ Church college, Oxford, survives as a monument to attest this. He was plainly a man of large and splendid capacity; and he seems, on the whole to have been a diligent, faithful, conscientious, and salutary counselor and servant of the monarch who so long and entirely trusted to him. There are lives of Wolsey by Cavendish (1667), Fiddes (1724), Galt (1812), and Martin (1862).

WOLVERHAMPTON, a municipal and parliamentary borough of Staffordshire, is the most populous town of its county, and a center of iron manufactures and tin-plate goods, 10 m. n.w. of Birmingham. Of its numerous churches, that of St. Peter's, built in the 14th c., and recently restored, is a stately edifice, with a lofty embattled and pinnacled tower. At Wolverhampton is published one daily newspaper and three weekly ones. The leading public schools are—a thriving grammar school, founded 1714; an orphan asylum, instituted 1850, for orphans from all parts of the kingdom, with 100 scholars, and room for 200; and a school of practical art, opened 1854. Among its philanthropic institutions, a general hospital and dispensary, opened 1849, having 100 beds, and, like the orphan asylum, supported by voluntary contributions, is the chief. Wolverhampton sent members to parliament first in 1832, and became a municipal borough in 1847. It has quarter-sessions of its own, a spacious cattle-market, and a market-hall. A commodious and handsome town-hall has been erected; there is a system of deep sewerage; and its abundant water supply is in the hands of the corporation. There is a handsome bronze equestrian statue of prince Albert standing in Queen square. The town possesses an exchange where iron-masters and merchants assemble; and an agricultural hall for the use of farmers and corn-dealers. Wolverhampton stands upon the western edge of the extensive coal and iron-mining district of South Staffordshire, and is the metropolis of that district. On the s. and e. the vicinity is covered with coal-mines, iron-stone pits, blast-furnaces, forges, rolling-mills, and foundries; but on the n. and w. it is rural and picturesque. Its chief manufactures are tin-plate and japanned goods (14 manufactories), enameled hollow wares, locks and keys, edge-tools, iron braziers and galvanized iron goods, gas and water tubes, cables and railway fastenings, iron-foundry goods, machinery, mills, cut nails, tips, cast hinges, electro-plate and

papier-mâché goods, brass castings, and finished iron. Besides the establishments engaged in the hardware manufacture, there are several flour-mills and chemical and artificial manure-works. The hardware goods manufactured at Wolverhampton are remarkable for beauty of finish and genuineness of workmanship. The town enjoys unusual facilities for communication and transport. For a considerable time it has commanded canal communication; and more recently, it has become the focus of a number of converging lines of railway, by means of which it is placed in direct relations with the important quarters of the country. Its market-day is Wednesday, under a charter by Henry III. (1258). The borough returns two members to the house of commons. Pop. '61, of parliamentary borough, 147,670; '71, 156,978. Pop. '61, of municipal borough, 60,860; '71, 68,291.

Wolverhampton, a town of considerable antiquity, was originally called Hampton, and afterward Wulfrune's Hampton (of which its present name is a corruption), from the circumstance that Wulfrune, the sister of king Edgar, founded here (996) the church and college of which St. Peter's is the modern representative.

WOLVERINE. See GLUTTON.

WOMEN'S RIGHTS. In 1851 an article in *The Westminster Review* attracted attention to the novel subject of the enfranchisement of women. Since that time the agitation for women's rights has in this country, and to a still greater extent in America, attained the dimensions of a political movement. The subject has, therefore, become one of general interest. The following is an account of the claims included in women's rights, and a brief statement of the chief arguments by which those claims are supported:

1. *The Political Rights of Women.*—The discussion has hitherto turned upon the right to the suffrage. The right to vote is claimed in accordance with the principles of political reasoning that are held conclusive in the case of men. The argument applies with peculiar force to a democratic constitution. Democracy involves two ideas. It is a protest against privilege and against despotism; it maintains that every individual is born with an equal right to the protection and consideration of the law; and it affirms that every one must have a vote in order to secure this fundamental right. The practice of the United States shows a gradual approach to those principles. Till lately, the negroes were refused the benefit of them; but the privilege founded on color has perished, and there remains now only the privilege founded on sex.

In England the right to vote has been made to rest on the principles of English law. A petition of women to the house of commons, presented on June 7, 1866, set forth that the possession of property in this country carries with it the right to vote in the election of representatives in parliament. From the earliest times the principle of the English constitution, and the spirit of the English people, have required that no man's property should be taken for the purposes of government without his consent. Since, therefore, the English law permits women to hold and manage property, it seems anomalous and inconsistent that it should refuse them a vote to protect their property from inordinate taxation. Other persons allowed by the law to hold property, but excluded from the suffrage, are minors, idiots, lunatics, and criminals. But the principle of disqualification in those cases does not apply to women. Moreover, there is alleged to be historical evidence that women have voted both in counties and boroughs. The disuse of the privilege is traced to historical causes. Such was the violence of the time that women were often unable to administer their property, and it was therefore natural that they should take little part in elections. Besides, the right to vote was at first regarded, not as a privilege, but as a burden; for the power of the commons was low, and the expense of paying members of parliament was considerable. The disfranchisement of women is therefore held to be an anomaly in the constitution, as it was an accident in history.

The objections to female suffrage are various. In an argument in the *Times* it is said: "There exists, as it were, a tacit concordat guaranteeing to the weaker sex the protection and deference of the strong, upon one condition only: that condition is the political dependence of women." This asserts a claim on the part of men to make laws for women, in return for protection and deference. Now, protection to person and property every one has a right to who obeys the laws and contributes to the support of the government. The reason for refusing votes to women must lie deeper. It may be said that, inasmuch as women are weak and at the mercy of men, men abstain from abusing their superiority only on one condition; that condition is, that women shall have no legal rights except those that men are pleased to give them. In the last resort the rights and privileges of any class of men depend on their might. The nobility established their privileges when they had power. The working-class has been admitted to the franchise because its power has increased. But women have no physical power to enforce their rights. If rights are to be measured by might, women will occupy the bottom of the scale. This is their position among savages. But, as civilization has advanced, men have learned to renounce the advantage of their physical superiority, and freely to give women privileges that could not have been extorted. It would, therefore, seem that the rights women actually enjoy do not depend upon, and are not to be measured by, their physical strength. The rights of women flow from the prevailing sense of justice, and justice now means that the interests of women be consulted with as much impartiality as the interests of men. An unjust preference of

either would be mischievous to both. Since, then, the interests of women should be fairly considered, what reason can there be to prevent them voting, and thereby intimating what views they take of their own interests?

Another objection to the enfranchisement of women is that women have no business with politics, and that politics would withdraw them from their proper duties. Is this apprehension well founded? Granting that domestic life is the proper sphere of women, is it really impossible to unite an interest in politics with attention to a family? Upon this subject we are not altogether without experience. In the great dissenting churches in Scotland women, though excluded from office, vote equally with men in the appointment of ruling-elders, ministers, and in everything that is decided by a popular vote. But this privilege has not "hardened" them or made them "unfeminine," or interfered with their household work. On the other hand it has largely contributed to the success of the voluntary system, and to the strength of the church. The chimerical nature of the alarm felt on this subject has been illustrated by the objections that might be made against allowing clergymen to vote. "We should be told that clergymen have no business with politics; that it was their province to attend to spiritual matters, and that they ought to confine themselves to their proper sphere; that if they were permitted to participate in political affairs, it would deteriorate from the sanctity of their character; that the passions roused by political contests were inconsistent with that spirit of meekness and holiness which we look for in preachers of the gospel." Women are not wholly excluded from politics. In some countries a woman may be sovereign; and history affords many examples of women that have had the highest capacity for government. Women in this country, if they have the same qualification as men, have parochial votes. And few would go so far as to propose that women should not only be shut out from public affairs, but also be kept ignorant of politics. Even if family-life be made their sole occupation, it surely is not to bound the horizon of their knowledge and sympathies.

The remaining objections may be taken together. They are of the same kind as those recently employed against the enfranchisement of the working-class. They are briefly: That the interests of women are not neglected, for they are represented by their male connections; that women are ignorant of politics; that they would be exposed to intimidation at home, and to violence at the polling-booths; and lastly, that women do not want votes. It is not allowed that women are sufficiently represented by their male connections. Such indirect influence is not considered, in other cases, to be a reason for withholding the suffrage. Rich men have a great indirect influence, but they have also votes. It is an old argument that operatives were represented by their employers; but that argument never convinced the operatives, and it has now ceased to affect the legislature. Why, then, should a *vicarious* representation, which is repudiated by every class of men, be considered sufficient for women? On the contrary, if women had votes their interests would be better attended to, because no member can disregard with impunity any important section of his constituents. It would be the policy of statesmen to devise and carry out measures for their benefit.

But, it is said women are ignorant of politics. This objection has lost much of its weight, now that household suffrage has been established. Educated women are surely not behind many of the new voters in political knowledge. Still, women, in general, know less of politics than men. They are constantly told that politics form no part of their business, and their opinions, like those of non-electors, have little direct and palpable influence on affairs. Political knowledge generally follows political power. Women have not the stimulus that acts on men; they have not the knowledge that their opinions form part of the legislative power.

There is little reason to fear that the possession of a vote would expose women to coercion and improper influence. The law has already defied a more serious danger. It permits women, and by special arrangement, even married women, to hold property, and it trusts its ability to protect them from the importunities of relations. If women can defend their property from greedy relatives, they will be no less able to give independent votes. The objection that women would be exposed to violence at the polling-booths, is not formidable. If such were the fact it would be no argument against female suffrage; it would be an argument against polling-booths. Should the police, however, be unable to protect female voters, there is the easy resource of voting-papers, already in use in the elections in the English universities.

The last objection is, that women do not want votes. A large number petitioned the commons in favor of extending the franchise to women that possessed a household qualification; those petitioners represent a very much larger number, who are kept back by the various social checks that prevent women taking part in political agitation. Nor can there be any doubt that a proposal that makes way with men simply on the ground of justice, will find still more favor with women, since their interest is ranged on the same side.

The claim of women to the suffrage is not without support from practical considerations. History teaches that women must have votes in order to protect their interests; men, through all the vicissitudes of history, have shown a constant preference of their own interests. In the words of lord Macaulay: "If there be a word of truth in history, women have been always, and still are, over the greater part of the globe, humble com-

panions, playthings, captives, menials, beasts of burden. Except in a few happy and highly civilized communities, they are strictly in a state of personal slavery. Even in those countries where they are best treated, the laws are generally unfavorable to them, with respect to almost all the points in which they are the most deeply interested."

In this country, women suffer from serious grievances. They are excluded from the universities, and no provision is made to give them the high education that men value. In consequence of this, men enjoy almost a monopoly of educated labor. Most of the charitable endowments for education in England were destined by the founders for girls as well as boys; but they have been generally appropriated to boys. Christ-church hospital was intended for boys and girls; it educates 1100 boys and 26 girls. Women also are excluded from the professions and the higher branches of industry. The situation of a governess is almost the only one open to educated women; from other occupations they are shut out, partly by rules, partly by neglected education.

The law is unfair to women, especially the law of marriage. Marriage is constituted by free consent, and is supposed to imply the approval of both parties. Now, it would be a hard bargain, where one of the parties was offered all the terms of it in the lump, and was therefore obliged to take everything or reject the whole; yet all the incidents of marriage, all the terms of the contract, are fixed by the law, and the law is made by men. In constituting the relation of marriage—a relation of even greater importance to women than to men—women have no voice, they have only a barren and impracticable veto. The result is familiar to every lawyer. By the law of England, the custody of a woman's children, after seven years of age, belongs exclusively to her husband; after they reach that age, she has no right even to see them. The common law strips a woman of her property, and leaves her fortune at the mercy of her husband; the husband also can seize his wife's earnings, unless she is protected by a judicial separation, or by an order from a magistrate. A married woman cannot enter into contracts. In practice, this bad law is avoided by settlements made before marriage; but this protection involves expense, and is in a great measure confined to the rich. More recent legislation is as unfair as the older law. In 1857 the divorce court was established, and it was enacted that, for adultery on the part of a wife, the husband could obtain a divorce; but for the adultery of a husband, a wife was not allowed a divorce. In addition to adultery, the husband must be guilty of cruelty or desertion. This inequality goes to the root of the marriage-contract: it means that, in consideration of maintenance, a woman gives her person to her husband, and therefore, unless she is ill-used or abandoned, she gets in substance what she bargained for. The law is severe on offenses against property; it is comparatively lenient in punishing brutal assaults by husbands on wives; garroters are flogged, but not wife-beaters. Finally, in the words of lord Brougham, "There must be a total reconstruction of the law, before women can have justice."

2. *The Industrial Rights of Women.*—These embrace admissibility to all offices, occupations, and professions; also admission to the universities, or some adequate provision for the education of women so as to fit them for high posts. This raises the question of the proper sphere of women. The prevailing ideas point to marriage as the true, if not the sole end of a woman's existence; but this theory is inadequate to meet our social difficulties. Many women are unmarried. What is to be done with them? To hinder them from doing the best they can for themselves, would be a manifest injustice; therefore, in the interests of single women, all occupations should be open. But the claims on behalf of women do not stop there. It is denied that men have any right to exclude women from active life, and so drive them into marriage as their only livelihood. On grounds of justice, the right of women to enter into industry is conceived as almost too clear for argument.

The objections to the industrial rights of women must be noticed briefly. It is said that the proper sphere of women is domestic life, and that she is by nature unfit for the struggles of industry. It appears from the census that just one-half of women above twenty years of age are confined to domestic life. About a third of the adult female population are either of independent means, or support themselves by non-domestic industry; the rest occupy a secondary position in the industrial world, by assisting their husbands in business. But though the number of women engaged in industry is great, they are confined to poorly-paid occupations, and their labor is for the most part unskilled. Generally speaking, the women of the middle class take no part in industry. The real issue is therefore narrow. It is not, shall women be admitted to industry? for that is settled; but, shall skilled and educated female labor be allowed? There is no evidence that women have no capacity but for the meanest employments. What they are fit for, can be finally determined only by actual trial. All that the advocates of women's rights ask is, do not anticipate the result, or foreclose the experiment. Some think that while it is desirable women should not be left unoccupied, they should not be admitted to industrial occupations, but society should seek a field for unmarried women, in some works of charity or religion, or in some semi-domestic pursuit. This proposal is an attempt to establish, in this country, that provision for unmarried women that is supplied by the monastic system in Roman Catholic countries. The objection to it is clear. If this semi-domestic pursuit is the most agreeable and lucrative to women, they will, of course, hail the discovery of it with gladness; but if it is not, they may decidedly object to make martyrs of themselves.

A common objection is, that to take women from domestic work would harden them, and destroy the peculiar traits of their character. Now, a great part of what used to be the work of the household has passed to another province, spinning, weaving, brewing, and baking were at one time domestic work. If women are to do their ancient customary work, they must follow it abroad. Those who believe that the peculiar attributes of women are an artificial product of civilization, may feel alarmed at any disturbance of the present condition. But the genuine distinctions between the sexes flow from organization, and will not be obliterated by similarity of education and employment; on the contrary, no feminine charm would be lost, but women would be more spirited, more intelligent, and fitter companions for men.

It is an argument sometimes relied upon that an admission of women to industry would be prejudicial to men, because it would increase the supply of labor, and thereby lower the rate of wages. This objection is founded on the principle that, when the wage-fund is constant, the rate of wages falls as the laborers are more numerous, and rises as they become less numerous. But the competition of women is, to some extent, an exception, for if they do not work for themselves they must be supported out of the wages of men. If, however, wages were to fall below the ordinary standard of comfort, the tendency would be, by fewer births or emigration, to reduce the excess of laborers till the supply of labor should be adjusted to the required standard of wages; and experience shows that wages are not permanently lowered by the admission of women to industry. In the working-class wages adjust themselves to a scale enabling a working-man to maintain a wife and family.

In the last place it is said that active life is inconsistent with the cares of maternity. This, of course, has no application to the large class of childless women; and there can be no necessity for prohibiting women from entering into industrial life if their situation renders it impracticable. The incompatibility between active life and maternity may safely be left to look after itself. From the returns in the census it appears that one out of eight married women are employed in non-domestic labor; but, since many of their occupations are not incompatible with household duties, and since many have no children to attend to, it seems probable that only among a small number of the working-class the duties of maternity are sacrificed to outdoor employment. It is, however, a moot-point how far maternity interposes a barrier to the industrial education and employment of women. In the working-class the mother usually nurses her children, for she could seldom make a profit by engaging in another employment, and hiring a servant; but if women were employed in skilled and well-paid occupations, they would probably leave nursing, which at present is unskilled labor, to servants. The solution of the problem must, however, be left to trial and experience. One principle, at any rate, is clear; except in so far as women are occupied as mothers, they should be employed in the most remunerative work. That would be beneficial to men, for it would relieve them of a pecuniary burden; it would be beneficial to women, for it would make them independent.

The women of the middle class, led astray by a mistaken aspiration to aristocratic leisure, have held aloof from the struggles and rewards of industry. This operates injuriously in various ways. It creates an unnatural competition with working-women, as in needle-work. Middle-class women often discharge duties that might well be left to upper servants. If they entered into commerce and trade they would fit themselves for, and require, a higher kind of occupation than those thankfully accepted by poor and untaught women. At present the higher walks of business, and even subordinate offices of trust and skill, are monopolized by men; hence women engaged in the lower employments derive little pecuniary benefit from trustworthiness, experience, or judgment, and have no hope of rising. If they should attempt to better their condition they are left without encouragement or support. The exclusion of women of the middle class from industry is hurtful to themselves. It often leads to poverty of the bitterest kind—the poverty of gentlewomen. It leaves them without occupation, a prey to *ennui* and bad health. It also forbids perfect companionship and sympathy between the sexes. The whole scope of a man's education is toward industry. In it he lives, and moves, and has his being. But of this world women have no direct knowledge. Hence a want of intellectual sympathy between men and women and an absence of any common standard of reasoning and evidence. Nor is this all. The virtues upon which industrial and public life repose do not derive due support from women. They are ignorant of the difficulties that beset moral problems under circumstances of which they have no experience, and their moral wisdom can hardly go beyond traditional saws. Indeed, their influence is sometimes on the wrong side. A man will be reluctant to injure his family in their pecuniary interests for some point of conscience that his wife does not sympathize with, or for objects that she does not understand.

No account of women's rights would be complete without some notice of the claim to equality in marriage. This is the goal to which history points. "Among tribes which are still in a primitive condition, women were and are the slaves of men for purposes of toil. All the hard bodily labor devolves on them. In a state somewhat more advanced, as in Asia, women were and are the slaves of men for purposes of sensuality. In Europe there early succeeded a third and milder dominion, secured, not by blows, nor by locks and bars, but by sedulous inculcation on the mind; feelings also of kind-

ness, and ideas of duty, such as a superior owes to inferiors under his protection, became more and more involved in the relation. But it did not for many ages become a relation of companionship, even between unequals." That stage has now been attained, and, "for the first time in the world, men and women are really companions." Women cannot be good companions for men unless they are equals. If they are kept inferior in education and knowledge their influence will tend to drag men down to their own level. The intercourse, moreover, that is of value is not intercourse between an active and a passive mind, but between two active minds. The theory of the subordination of women involves several bad consequences; for, women being unable to attain their ends directly, have recourse to management and artifice.

The general movement of society is from subordination to equality. Under the feudal system society was constituted on the principle of subordination. The land was tilled by serfs, and there were few but said that serfdom was the natural position of a creature so low as an agricultural laborer. But serfdom did not endure, and we have learned that it is happier for all parties that the land should be tilled by freemen. And now, too, negro slavery, the most plausible form of slavery, has been abolished. The tendency of social changes is toward equality, as the most satisfactory relation between man and man; it also seems to point to equality as the highest relation between man and woman.

In the year 1869 an important step was taken toward the recognition of the claim for the concession of political franchises to women. In a bill passed in parliament respecting municipal elections a clause was inserted extending the right of voting at such elections to women. Similarly, by the English and Scotch education acts of 1870 and 1872, women are permitted to vote at the elections of school-boards.—The subject of women's rights is discussed in the following: *Dissertations and Discussions*, by J. S. Mill, vol. ii., "Enfranchisement of Women;" *The Political and Social Dependence of Women* (1867); *The Industrial and Social Position of Women* (1857); speech by J. S. Mill in house of commons, May 21, 1867; *The Westminster Review*, Jan., 1867; prof. Cairnes in *Macmillan's Magazine*, Sept., 1874.

WOMEN'S RIGHTS (*ante*) in the United States have sensibly advanced within the last 20 years in important particulars. The right of suffrage is not generally conceded as yet, nor is it likely soon to be, but important experiments have been made in that direction. Thus the territory of Wyoming in 1869 gave women the right of suffrage and admitted them as jurors; the state of Massachusetts allows women to vote in town elections for members of the school committees, and to be eligible for the position; and in both cases the experiment seems to have been fairly successful. The more prominent members of the woman's suffrage associations have claimed the right to vote under the U. S. constitution as it now stands, but all test cases have been decided adversely. The most noted of these cases are the appeal of Virginia L. Minor from the Missouri supreme court, in which an adverse decision was given by Waite, chief-justice of the U. S. supreme court, in 1874, and that of Susan B. Anthony and others, tried in 1873 before justice Hunt, of the supreme court, in the U. S. circuit court for northern New York. Salutary legal reforms as to the property rights of married women have been made in New York, Connecticut, and many other states, the general result being to give a married woman control of her separate property and of that acquired by her own skill or labor after marriage. There are at present two great branches of the women's suffrage movement in this country—the national association, of which Elizabeth Cady Stanton, Susan B. Anthony, Matilda Jocelyn Gage, and others are prominent members; and the American woman's suffrage association, with which Mrs. Lucy Stone, Julia Ward Howe, and Mrs. Livermore are connected.

WOMB. THE, professionally known as the *uterus*, is a flattened, pear-shaped organ, whose position and various parts will be best understood by a reference to fig. 1. It consists of a body (1), a base or fundus (2), a neck or cervix (3), and a mouth or *os uteri* (4). It lies in the line of the axis of the outlet of the pelvis (q. v.), with base directed upward and forward, and the neck directed slightly backward. In the unimpregnated condition, which we are now considering, it is about three inches in length, two in breadth, and one in thickness, and weighs about an ounce and a half. On laying it open, or exploring its interior by the introduction of an instrument through the *os uteri*, its cavity is found to be very narrow, and to contain a little mucus. Its walls are nearly half an inch thick, and are mainly composed of muscle-cells and fibers running irregularly in all directions except round the *os*, where they make a partial sphincter. This muscular coat, which constitutes the bulk of the organ, is covered externally with a serous coat, derived from the peritoneum, and is lined internally by a mucous coat continuous with that of the canal called the *vagina*, by which the interior of the womb communicates with the outer surface of the body. This mucous coat abounds in small mucous follicles, and is provided with ciliated epithelium (q. v.). The neck or *cervix* of the womb is distinguished from the body by a well-marked constriction. The mouth, or *os*, projects slightly into the vagina (which is shown as laid open anteriorly in the figure). This opening is nearly round in the virgin, and transverse after parturition. It is of considerable size, and is named the *orificium uteri externum*; it leads into a narrow canal which terminates at the upper end of the *cervix* in a smaller opening, the *orificium*

internum, beyond which is the shallow triangular cavity of the womb, of which it forms the lower angle, while the two upper angles, which are funnel shaped, constitute the beginning of the Fallopian tubes (q.v.), whose apertures are so small as only to admit the passage of a fine bristle. The blood-vessels and nerves enlarge in a very remarkable way during pregnancy, so as to adapt themselves to the increased wants of the organ, which, at the ninth month of utero-gestation, weighs from two to four pounds. The term *appendages to the uterus* is given to the Fallopian tubes and ovaries (q.v.) which are inclosed by the lateral folds of the peritoneum called the broad ligaments. The womb is suspended in the pelvic cavity in such a way as, by its mobility, to escape rude shocks from without or disturbance from the varying conditions of the surrounding viscera, while at the same time to allow of its vastly increasing in bulk with comparatively little discomfort when pregnancy occurs. This is effected by several duplicatures of peritoneum, containing variable quantities of fibrous and muscular tissue, and known

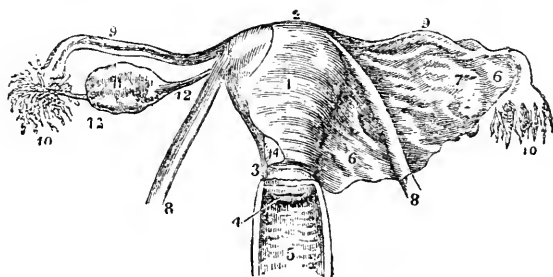


FIG. 1.—THE UTERUS AND ITS APPENDAGES VIEWED ON THEIR ANTERIOR ASPECT:

1, the body of the uterus; 2, its fundus; 3, its cervix; 4, the os uteri; 5, the vagina laid open; 6, the broad ligaments of the uterus on left side; 7, a convexity of the broad ligament caused by the ovary; 8, 8, the round ligaments; 9, 9, the Fallopian tubes; 10, 10, their frimbriated extremities; 11, the right ovary; 12, the utero-ovarian ligament; 13, the Fallopio-ovarian ligament, on which some small fimbriae are continued for a short distance; 14, peritoneum of anterior surface of uterus. The membrane is removed on the right side to show the parts imbedded in its folds.—From Wilson's *Anatomist's Vade Mecum*.

from their form or connection as the *broad*, the *round*, the *utero-sacral*, and the *utero-vesical* ligaments.

The uterus is an organ peculiar to the mammalia, and in comparatively few of them (excepting the apes and cheiroptera) is it of the simple oval or triangular form which we have described. It is *two-horned* in the ruminantia, pachydermata, solipedia, and cetacea; and it is said to be *divided* where it has only a very short body, as in most of the carnivora and edentata, and some rodentia, which speedily divides both externally and internally, and is continuous with the oviducts or Fallopian tubes. The uterus is actually *double* in some of the edentata, and in most of the rodentia, including the mouse and hare; in which each Fallopian tube passes into an intestiniform uterus, which has two completely distinct openings lying near to each other within the vagina. In the marsupia and monotremata, the modifications of this organ are still more singular.

It is impossible to do more than name the chief offices or functions of the womb. They may be divided into those which relate to (1) menstruation (q.v.), (2) insemination, (3) gestation, and (4) parturition.—For a complete account of the anatomy, physiology, and pathology of the uterus and its appendages, we must refer to a masterly article by Dr. Arthur Farre on that subject in the last volume of the *Cyclopædia of Anatomy and Physiology*.

WOMB, DISEASES AND DERANGEMENT OF THE. In this article we shall not include the ailments of the pregnant or of the puerperal state, some of which, as *phlegmasia dolens* and *puerperal fever*, have been noticed in special articles. Many of the diseases, however, which we shall have occasion to notice may be traced to pregnancy, miscarriage, or severe delivery, that had occurred months previously. A common result of inflammation that often succeeds miscarriage or a bad delivery is to check that process of involution by which the womb ought to be restored in a few weeks to the size and condition in which it existed previous to the occurrence of pregnancy. For a lucid description of the processes which act on the enlarged womb to restore it to its original state, we must refer to Dr. West *On Diseases of Women*, 2d ed. p. 90. How inflammation acts in interrupting these processes, is not easily explained; but after it has passed away, its effects may remain in the enlarged size and altered structure of the womb, changes which render it likely to suffer from the alternation of activity and repose to which the female generative system is liable. In this condition, the enlarged and heavy uterus is very likely to become prolapsed, or to become a seat of permanent congestion or chronic inflammation; and excessive menstruation and a feeling of weight in the pelvis are almost always present. Besides this form of enlargement, there is a far less common

form in which the enlargement of the womb takes place independently of previous pregnancy, and is the result of true hypertrophy. The symptoms are, according to West, "a sense of weight in the pelvis, pain usually of a burning character, hemorrhages having gradually come on, and forced themselves by their slowly increasing severity on the patient's notice." The treatment is much the same in both these forms of enlargement—viz., the recumbent position on a hair or spring mattress, attention to the bowels, and local leeching every fortnight, to be continued for several months, together with the careful use of iron associated with small doses of iodide of potassium. Temporary separation from the husband's bed should also be insisted on. There is also a form of hypertrophy which is confined to the neck of the womb, which occasions great discomfort to the patient, and acts as a mechanical impediment to sexual union. In these cases, no relief can be afforded except by a surgical operation, which is described in West, *op. cit.* p. 77.

From these results of "simple errors of nutrition," leading to increased growth of the organ, we pass on to the debatable and much-trodden ground of *inflammation of the womb*. *Acute inflammation* of the unimpregnated womb may arise from unaccustomed and excessive sexual intercourse, sudden suppression of the menstrual discharge, the extension of gonorrhoeal inflammation, etc.; but, as it is comparatively rare, and seldom dangerous to life, we shall at once pass on to an affection which by most practitioners is regarded as one of the commonest to which woman is liable—viz., *chronic inflammation and ulceration* of the neck of the womb. It is not forty years ago since a French physician, M. Recamier, invented an instrument—the speculum—for the application of local remedies to the neck of the womb in cancer; but the light which this instrument threw upon uterine conditions generally, led, among other results, to the conclusion, that leucorrhoeal discharges (popularly known as *the whites*) were often derived from, and associated with, various morbid appearances of the mouth of the womb, and could often be removed by remedies directed to that part. Almost ever since the speculum began to get into general use, a large number of old-fashioned practitioners raised up a cry against its employment, on the grounds of its indelicacy, its inutilty, etc., and denied the very existence of various morbid conditions, which the employers of the instrument declared they saw with its use. Hence two parties have arisen—one who believe in the speculum and its revelations; and another who reject the recent modes of investigating uterine diseases, who take small account of the new facts regarding *local* disease which have been revealed, and who regard uterine ailments as resulting from constitutional derangements, and who therefore trust mainly to general treatment. Now, although the view that the local disease is everything, may not be universally true, the opposite view is certainly untenable; and Dr. West and other writers on this subject have pointed out that there are reasons why the womb should more frequently than perhaps any other organ be the seat of certain forms of local ailment, and should consequently require the frequent employment of local treatment. It would be out of place in these pages to describe the characters of the ulcerations or abrasions of the mouth of the womb, which are so frequently revealed by the speculum, or to enter into any detail regarding the high pathological importance attached by some writers to them. The conclusion which Dr. West draws from a prolonged investigation of this subject is, that "the condition of so-called ulceration or abrasion of the os uteri is far from infrequent, even in cases where no uterine symptoms were complained of during life; but that it is usually unassociated with other important affections of the uterus, such as may be supposed to be the effects of inflammatory action; and, further, that such affections do not seem to be readily excited by causes acting on the neck of the womb, either when displaced, or when the organ is in its natural position."—*Op. cit.* p. 120. Since uterine pain, disordered menstruation, and leucorrhoeal discharges—the symptoms usually associated with ulceration of the mouth of the womb—are met with by impartial observers almost as frequently *without* as *with* ulceration, it may be fairly inferred that this ulceration is neither a general cause of uterine disease, nor a safe index of its progress; and although the local application of caustic to the os uteri is doubtless often successful in restoring the patient to health, it must not be considered as a general rule that the attempt, by local remedies, to remove this condition is the one and all-important point in the treatment of uterine disease. There is no doubt that, in the great majority of these cases (excepting a few of the more severe ones), temporary separation from the husband's bed, the recumbent position (which facilitates the return of blood from the womb and adjacent parts), due attention to the diet and state of the digestive organs, and the use of injections of nitrate of silver, which may be applied by the patient, are sufficient in a few weeks to effect a cure. Chronic uterine inflammation of a more general nature (as of the interior, or body of the womb), with very similar symptoms, is by no means rare. If the disease is met with in the acute form, leeches should be applied to the womb itself; in the chronic form, which is generally observed, the pain in the back is best relieved by a croton-oil liniment, composed, according to Dr. West's directions, of one part of croton oil to ten of the camphor liniment (of the London Pharmacopœia) which should be applied (without rubbing it in) with a sponge twice a day on the back, at the seat of pain. Belladonna plaster or liniment also gives temporary relief. The irritability of the bladder, which is a common symptom, is usually associated with abundant phosphatic deposits in the urine, and is best relieved by a combina-

tion of ten or fifteen minims of dilute hydrochloric acid, half a dram of tincture of heubane, and two ounces or more of decoction of pareira-brava (see CYSSAMPELOS), three times a day; and the tepid hip-bath may be used with benefit. The same general rules as to rest, diet, etc., which have been already given, must be attended to. Under the best management, a tendency to relapse is liable to occur at each monthly period, and after several such relapses, the womb is found (on surgical examination) to be enlarged and hardened, and less movable than natural. This condition is best removed by the careful and prolonged use of bichloride of mercury in small doses, which, as it is a deadly poison, must only be taken by professional advice; but the pain in the groin which usually accompanies this change, may be relieved or removed by the application of a small blister. The profuse discharge—both menstrual and leucorrhœal—is best relieved by chalybeate preparations, of which the following is a useful and favorite compound: Take of sulphate of iron, 6 grains; sulphate of magnesia (Epsom salts), 3 drams; dilute sulphuric acid, half a dram; syrup of orange peel, half an ounce; caraway water, sufficient to make a mixture of 6 ounces, of which 1 ounce may be taken thrice daily, after meals; or if there be much hemorrhage, a mixture of alum and sulphate of iron (4 grains of the former to 1 of the latter, dissolved in a small tumbler of water) may be taken three times a day. A hip bath, containing half a pound of alum to every gallon of water, is often very useful as an astringent. It should be taken in the morning before dressing, and the patient should remain in it at least a quarter of an hour. For the first time or two, the water may have the chill just taken off. The same importance is not at present attached to vaginal injections as when it was believed that the vagina (and not the womb) was the main source of leucorrhœal discharge. In a case of leucorrhœal discharge of long standing, an excellent astringent injection may be formed by dissolving two drams of tannin and half an ounce of alum in a quart of water. Special forms of female or vaginal syringes are sold for this purpose. Of the application of caustics to the mouth of the womb, we say nothing, as that is a matter which must be left solely to the medical attendant.

From these remarks on the diseases of this important organ, we pass on to a very brief notice of its occasional *misplacements*. The singular mobility of the womb (without which pregnancy would be almost an impossibility) exposes it to the risk of displacement to such a degree as often to give rise to great personal discomfort. As all the causes which tend to produce displacement (such as increased weight of the organ during pregnancy, pressure of the superincumbent viscera, etc.) act in a downward direction, the obvious tendency of the womb is to be thrown downward, or to suffer *prolapsus* (q.v.), an affection which, in its extreme degree, when the organ is more or less protruded externally, is termed *proidentia*. Causes sometimes come into play which incline the upper part of the uterus either backward or forward, giving rise to *retroversion* and *anteversion*, instead of mere prolapse. Prolapsus is sufficiently considered in the article bearing that title; and for a description of the symptoms and treatment of the two last-named misplacements, we must refer our readers to the standard works on the diseases of women.

The tendency of the womb to hypertrophy has been noticed at the beginning of this article; its individual tissues have a similar tendency to overgrowth, showing itself at particular parts, and thus giving rise to tumors or outgrowths, which are more common in this than in any other organ. Under this head may be mentioned several varieties of *polypus*, which differ essentially in structure, but all of which are invested by the mucous membrane which lines the uterus, and are liable to be the source of hemorrhage. Their removal by surgical means is generally a matter of no difficulty. Much more important than these is the *fibrous tumor*, which is frequent in its occurrence, serious in its effects, and very slightly amenable to treatment. These tumors are of a spherical form and firm texture, resembling that of the womb itself, and usually occur in groups; several being frequently present, while one or two are considerably larger than the others. The symptoms to which they give rise vary extremely according as the chief tumor lies on the outer part of the womb, and grows into the abdominal cavity, or is developed within the walls of the womb, or projects into the interior. They may be of almost any size, cases being on record in which they weighed from 70 to 80 pounds. In regard to the symptoms of this affection, it must be premised that sometimes these tumors exist without exciting any disturbance, and that growths on the outer surface give rise to comparatively unimportant derangements, compared with those which are imbedded in the walls, or occupy the cavity of the womb. It will be readily understood that women who have passed the change of life (as it is popularly called) suffer less from these tumors than younger women. The diagnosis of fibrous tumor is effected partly by manual and instrumental examination (into which we shall not enter), and partly by the symptoms—such as (1) hemorrhage occurring in about 50 per cent. of cases independently of their nature; (2) disturbance of the menstrual discharge in 62 per cent. of cases, it most commonly being excessive and often painful; (3) pain, usually constant, and occasionally only at the menstrual period, described by some patients as a burning sensation, by others as a sense of bearing down, and by a few as occurring in paroxysms of intense agony; (4) dysuria—pain in voiding urine, or difficulty in discharging it, or frequent desire to pass it. It is usually hemorrhage, or inability to void the urine, that first directs the attention of the patient to her malady. Its tendency to excite abortion

often leads the physician to suspect its presence. Although, as we previously mentioned, this is an affection little amenable to treatment, a woman with these symptoms should at once consult a physician (if possible, the physician-acconcheur to a large hospital), who, by his advice as to the general management of the case, especially during the menstrual period, may do much to palliate her sufferings. Iodine, bromine (and certain mineral waters containing these elements), and mercury have been vaunted as specifics, but nothing positive can be said regarding their successful action; and certain surgical operations have been recommended, which are accompanied with so much danger to the patient that it is needless to refer to them. But although the action of medicines on these growths is avowedly uncertain, nature in this as in many other cases, not unfrequently strives toward a more or less complete cure. For example, if the tumor is pediculated, and lies in the uterine cavity, the pedicle may finally give way, and the tumor may be expelled; or certain changes may take place in the interior of a tumor, leading either to its disintegration and elimination, or to its conversion into a chalky mass, which, though not eliminated, induces no local disturbances. These spontaneous cures are by no means rare, although we can hardly lead the patient to expect them in any special case.

We shall conclude with a few words on a disease which is the most painful and hopeless of all the disorders to which humanity is liable—*cancer of the womb*. It is a disease whose leading features as thus graphically—we may almost say, painfully—described by Dr. West: “Pain, often exceeding in intensity all that can be imagined as most intolerable, attended by accidents which render the sufferer most loathsome to herself and to those whom strong affection still gathers round her bed; the general health broken down by the action of the same poison as produces the local suffering, and all tending surely, swiftly, to a fatal issue, which skill cannot avert; from which it can scarcely take away its bitterest anguish.” The three most constant symptoms are pain, and hemorrhage, and discharge. From an examination of 132 cases by the above-named physician, the first symptom was found to have been,

In 58 instances, or 43.9 per cent, hemorrhage without pain.			
“ 26	“	19.6	“ pain of various kinds.
“ 18	“	13.6	“ hemorrhage with pain.
“ 18	“	13.6	“ leucorrhœa or other discharge without pain.
“ 12	“	10.3	“ pain and discharge sometimes offensive.

It is unnecessary to enter into further details regarding the symptoms of this disease, as cases of this nature must always be under medical superintendence, and for the same reason we need only say regarding the treatment, that it is divisible into the *palliative* and the *curative*, the former being directed toward the three great symptoms, and the general symptoms of the cancerous cachexia (or constitution), while in the latter are included the operation of extirpating the whole womb, or removing the neck of the womb by ligature or excision. It is difficult to speak with accuracy regarding the frequency of this disease. An approximate estimate may be formed from the fact that, in 1877, the mortality from cancer in England amounted to 3,623 males and 8,038 females; the excess in the latter case, amounting to 4,115, must be due to cancer of the breast or womb; and according to Tanchou, a French pathologist, cancer of the womb is more frequent than that of the female breast in the rate of 26 to 10. Hence the yearly deaths from uterine cancer in England amount to about 2,972. The last-named writer calculated, from ten years' observation of the French records of mortality, that this disease causes 16 per 1000 of all female deaths. The disease is very rare before the 25th year, and by far the most common period of its appearance is between the ages of 40 and 50 years. Its average duration is 16 or 17 months, but it may prove fatal in 3 or 4 months. On the subject of cancer of the womb, Walsh *On Cancer* may be consulted; and for further information on the subject of this article generally, the reader is referred to the standard works of Churchill, Lever, Simpson, West, etc.

WOMBAT, *Phascolumys*, a genus of marsupial quadrupeds, constituting a distinct family, *phascologydæ*, and of which only one species is known, *phascolumys wombat*, a native of Australia, abounding chiefly in mountainous districts of New South Wales, Victoria, South Australia, and Van Diemen's land, and in the islands of Bass's strait. In many of its characters, it resembles the *rodentia*. The incisors are two in each jaw, long, and chisel-like; they are hollow at the base, and continue to grow as they are worn away; there are no canine teeth; and the molars are five on each side in both jaws. There is a wide gap between the incisors and the molars. The wombat is an animal of clumsy form, having stout limbs and a blunt muzzle. It is 2 or 3 ft. long, plump, with a thick coat of long, grayish brown, coarse woolly hair; the head large, flat, broad, with small eyes and ears, the upper lip cleft; the feet five-toed, the claws long, except those of the inner toes of the hind feet; the tail very short. It is plantigrade, and the soles of the feet are broad and naked. It is nocturnal in its habits, slow in its motions; feeds on vegetable substances, and digs up roots with its claws; it makes its abode in holes among rocks, or in burrows dug by itself. It produces three or four young at a birth. It is a creature of little intelligence, but gentle, and easily domesticated to a certain extent, not seeming to care much for any change of circumstances, so long as its wants are supplied. It shows considerable snappishness, however, if provoked. Its

flesh is preferred to that of any other quadruped of Australia. It is generally fat, and in flavor resembles pork. Wombats have frequently been brought alive to Britain.—The remains of a fossil species have been found in the caves at Wellington valley, Australia.

WOMEN, MEDICAL EDUCATION OF. The medical education of women is recent. Facilities are now offered to women for the study of medicine in the United States, England, and the continent of Europe. Diplomas have been granted to women by the faculty of Paris, where the range of study is extensive and arduous. The German universities are not so favorable to the pursuit of medical studies by women, but the German cities are visited by them for private instruction. The university of Zurich in Switzerland is attended most by women, where a number always are in attendance upon full courses of lectures and instruction. There is an independent medical school for women in London, which was established principally in consequence of the exertions of Dr. Elizabeth Blackwell of New York. More encouragement, however, has been given to the medical education of women in the United States, and there are now numerous institutions which afford ample opportunities. In the commencement of the movement, the teaching was done by irresponsible and irregular persons, so that for a time there was necessarily a considerable want of confidence among intelligent people in female doctors, but recently much of this has been corrected, and many institutions pursue a thorough course. The women's medical college of Pennsylvania at Philadelphia has been in existence over thirty years, and has an efficient faculty composed of both men and women of good professional standing and attainments. The New York infirmary for women and children, is about a quarter of a century old. It was founded by Drs. Emily and Elizabeth Blackwell. From the first this institution was conducted by women. During the past fifteen years, it has maintained an associate medical college, with a full faculty of regular professors and teachers. The New England woman's hospital of Boston is in good standing, and the medical department of the university of Michigan at Ann Arbor admits both sexes. Other institutions for the medical education of women are the women's hospital medical college of Chicago, Ill., and the university of Wooster, at Cleveland, Ohio.

WOMEN, PRIVATE COLLEGIATE INSTRUCTION FOR. See COLLEGIATE INSTRUCTION FOR WOMEN, PRIVATE.

WOOD, a co. in n. Ohio, having the Maumee river for its n.w. boundary, drained by the Portage river and Beaver creek; 570 sq.m.; pop. '80, 346,026—30,174 of American birth. It is intersected by numerous railroads. Co. seat, Bowling Green.

WOOD a co. in n.e. Texas, having the Sabine river for its s. boundary, drained by the Lake Fork; 500 sq.m.; pop. '80, 11,212—11,074 of American birth, 2,559 colored. Co. seat, Quitman.

WOOD, a co. in w. West Virginia, having the Ohio river for its n.w. boundary separating it from the state of Ohio, drained by the Little Kanawha river; 400 sq.m.; pop. '80, 25,006—23,748 of American birth, 923 colored. Co. seat, Parkersburg.

WOOD, a co. in central Wisconsin, drained by the Wisconsin and Yellow rivers and Mill creek; 828 sq.m.; pop. '80, 8,981;—6,346 of American birth, 20 colored. Co. seat, Grand Rapids.

WOOD, ALPHONSO, 1809–80; b. N. H.; graduated at Dartmouth in 1834; studied at Andover seminary one year; taught at Kimball Union academy, Meriden, N. H., 1834–49; followed civil engineering; president of Ohio female college, 1851–57; professor in Terre Haute female college, 1857–60; principal of Clinton female seminary, Brooklyn, N. Y., 1860–65. He was a distinguished botanist. His publications are: *Class-Books of Botany*, which has had an extensive sale; *First Lessons in Botany*; *The American Botanist and Florist*; *Leaves and Flowers*; *Flora Atlantica*.

WOOD, ANTHONY, of some note as an antiquary, was born at Oxford in the year 1632. His school education he received chiefly in the place of his birth, and in 1647, he was entered at Merton college as a gentleman commoner. In 1652, he took his degree as bachelor, and in 1655, became master of arts. Deriving from his father an independence, he seems at first to have aimed at being a sort of Jack-of-all-trades, as not bound in penalties of hunger to follow out any particular one. He practiced the fiddle assiduously, and is said to have attained considerable skill. Painting was also one of his innocent hobbies, but none of his pictures have been preserved to enable us to test his proficiency. In addition to these accomplishments, it was his whim to concern himself with heraldry and other antiquarian pursuits. He labored much in the libraries, and presently came to be noted for his curious turn that way. In 1656, he came upon Dugdale's *Antiquities of Warwickshire*, shortly before published, the perusal of which greatly delighted him, and awoke in him the fire of emulation. He now worked still more assiduously; and went about among the tombs, copying old inscriptions. As the fruit of these learned labors, he gave to the world, in 1669, his *History and Antiquities of Oxford*. For the copyright of this work Wood received £100 from the university; and Dr. Fell, dean of Christ church, thought so highly of it that he employed one Peers, a student, to execute a Latin translation of it. The *Historia et Antiquitates Universitatis Oxoniensis* was published at Oxford in 1674.

Subsequently, in 1691, as result of his further investigations, Wood published his *Athenæ Oxonienses*, containing a full and particular account of all the authors, bishops, etc., who had adorned that seat of learning from 1500 to 1690. In this work, he attacked the character of the great lord Clarendon, deceased; a misdemeanor for which he was prosecuted at the court of the university, and expelled. He did not long survive this disgrace, dying Nov. 29, 1695. His books, and a selection of his manuscripts, he left to the university of which he had ceased to be a member, and they are preserved in the Ashmolean museum. His life may be found at large in the edition of his *Athenæ Oxonienses* issued by Dr. Bliss in 1848.

WOOD, ELLEN (PRICE), b. England; about 1820; became a magazine and story writer, and has published a large number of novels, mostly sensational, but very popular. Among those most read are *East Lynne*, *The Channings*, *Trevelyn Hold*, and *Red Court Farm*.

WOOD, FERNANDO, 1812-81, b. Philadelphia, went to New York in his youth, engaged successfully in business, and became a ship-owner. He took part in local politics and in 1840 was elected to congress, serving in 1841-43, 1863-65 and from 1867 to the time of his death. He was mayor of New York, 1855 and 1861, and in the latter year, during the rebellion, is said to have made the astounding recommendation that New York should secede and become a free city. Though opposed to the war against secession he favored its prosecution after it broke out. He was one of the ablest leaders of the democratic party in congress; and the tariff bill of 1878, reported by the committee of which he was chairman, was one of the most important measures introduced of late years.

WOOD, GEORGE B., LL.D., 1797-1879, b. N. J.; graduated at the university of Pennsylvania, which gave him a medical degree in 1818. He held the chair of medicine at the Philadelphia college of pharmacy, 1822-31, and of materia medica at the same institution, 1831-35. He was professor of materia medica at the university of Pennsylvania, 1835-50, and of the theory and practice of medicine, 1850-60. Among his works are *A Treatise on the Practice of Medicine* (1847), and *Therapeutics and Pharmacology* (1856).

WOOD, JAMES, 1740-1813, b. Va.; a delegate to the Virginia convention of 1776. The same year he was appointed a col. in the Virginia militia. He was afterward lieutenant-governor of Virginia, served on the executive council and was governor, 1796-99. He was a son of col. James who founded the town of Winchester. Wood co. was named from him.

WOOD, JAMES FREDERICK, b. Philadelphia, 1813; educated in England; from 1827 to 1837 resided in Cincinnati and was a bank officer. In 1837 he went to Rome, studied for the priesthood for seven years and then returned to Cincinnati and became assistant rector in the cathedral. In 1857 he was consecrated coadjutor-bishop of Philadelphia, and in 1860 succeeded to the bishopric. He visited Rome several times and attended the Vatican council of 1869. In 1875 he was consecrated archbishop of the newly created see of Philadelphia.

WOOD, JOHN GEORGE, b. London, 1814, educated at Oxford, and ordained in the church of England. He has written several popular works on zoology, such as a *Popular Natural History*; and *Sketches and Anecdotes of Animal Life*. Among his other works are *Homes without Hands*; *Insect Life*; *Natural History of Man*; *Natural History*, his principal work; *Man and Beast*; and *Insects Abroad*.

WOOD, ROBERT, 1716-71, b. Meath, Ireland; educated at Oxford, traveled extensively in Europe, and in 1750 made valuable archaeological explorations in Syria and Asia Minor. He published *The Ruins of Palmyra*; *The Ruins of Balbec*; and an essay on the *Original Genius and Writings of Homer*.

WOOD, THOMAS JEFFERSON, b. Ky., 1823; appointed to the topographical engineers after graduating at West Point in 1845. He served in the Mexican war, and was afterward stationed on the Texan frontier. In 1862, at the head of the 6th division of the army of the Ohio, he was at Shiloh and Perryville, and was wounded at Stone river. He commanded a division in the 21st corps, in the Tennessee campaign in 1863, and was at the battle of Chickamauga. At Missionary Ridge he commanded a division of the 4th corps, was at the capture of Atlanta, and commanded the 4th corps in the campaign against Hood in Tennessee. He resigned with the rank of major-general in 1869.

WOOD, WILLIAM MAXWELL, 1809-80; b. Baltimore, entering the navy as assistant surgeon, he was appointed surgeon in 1838, was fleet surgeon to the Pacific squadron 1844-46, and to the north Atlantic squadron, 1861-65. He became chief of the bureau of medicine and surgery in the navy department in 1870, was appointed surgeon-general in 1871, and retired in 1872. He has published several books of travel.

WOOD AND WOODY FIBER. The hard and compact or tough and fibrous parts of plants are composed chiefly of a peculiar kind of vascular tissue (q.v.), which, when compact is *wood*. It exists chiefly in the stems, frequently in the roots, and also in the inner bark of exogenous plants, which yields many of the most valuable fibers used in the arts, and in the midrib and veins of leaves, some very useful fibers being obtained from the leaves of endogens. See **FIBER**. Annual plants contain little or no woody fiber, being composed chiefly of cellular tissue (q.v.), which also forms great part of many herbaceous perennials and of all plants in a very young state. Woody fiber con-

sists of elongated cells tapering to both extremities, lying close together, and overlapping one another, sometimes much elongated into tubes. Wood is entirely made up of cells of this kind, permeated in exogenous plants by medullary rays. The cells of woody fibre have their walls thickened by successive layers of cellulose and lignine, deposited in their interior, so that they acquire strength. In the inner bark of exogens, woody fibre is mixed with laticiferous vessels (see LATEX) and cellular tissue.

Woody fiber has generally no definite markings on the walls of its cells; but these sometimes appear as simple disks, or as disks with smaller circles in the center. These disks are formed by concavities on the outside of the walls of contiguous cells, closely applied to each other, so as to form lenticular cavities between them, as Mr. Queckett proved in fossil pine-wood, in which he separated lenticular masses of solid matter from between the disks. When the smaller circle appears in the center of the disks, the woody tissue is described as *punctated*. This is especially the case in *coniferae*, but it is not absolutely distinctive of them, the same character appearing also in some other plants, as in Winter's bark. The small circle in the center of the disk is formed by the mouth of a canal, often funnel-shaped. These canals or pores, connecting one cell with another, are supposed to give to the wood of the *coniferae* its peculiar fitness for making musical instruments.

Woody fiber is not properly formed unless the leaves of plants are well exposed to the light. There is no doubt that the cambium (q. v.) performs an important part in the formation of wood. There has been much difference of opinion among vegetable physiologists, however, as to the mode of its formation. Two principal theories have long had and still have their advocates—the *horizontal* and *vertical* theories. According to the former—supported by Duhamel, Decandolle, Schleiden, Mirbel, Naudin, Henfrey, etc.—the wood of trees is formed by horizontal extension from the stem or from the bark, or from both, for there is much diversity of opinion as to these particulars. According to the latter—supported by Knight, Petit-Thouars, Gaudichaud, Lindley, etc.—the wood is developed in a vertical direction from the leaves, every bud being, as the elder Darwin long ago maintained, an embryo plant sending leaves upward and roots downward.

Wood is not only valuable as timber (q. v.), but for fuel, being the chief fuel used in many parts of the world. To woody fiber we are indebted also for great part of our cordage and textile fabrics, including the very finest of them, as muslin and lace. Reduced to pulp, it is used for the manufacture of paper.

A kind of factitious or artificial wood, used for making ornamented articles, has recently been invented in France. It is called *bois duré*. It is formed of sawdust, heated to a high temperature, and subjected to very great pressure. Its compactness and hardness exceed those of wood itself. Another kind is made by mixing blood with sawdust, and compressing. Some kinds of costly wood are also imitated by mixing their sawdust with glue, and casting the mixture into the desired shape in molds.

WOOD-BINE. See HONEYSUCKLE.

WOOD-BRIDGE, a market-t. and river-port of Suffolk. on the right bank of the Deben, which here expands into an estuary, 11 m. from the sea, and 8 m. e.n.e. of Ipswich. Vessels of 120 tons can reach the town. There are a custom-house, a bonding warehouse, and docks in which ship-building is carried on. The church is a striking edifice of black flint and freestone, with a magnificent tower. There is also a richly endowed charity which supports an excellent and well conducted grammar-school, commodious and extensive almshouses, a public dispensary and library. Corn, flour, and malt are exported. In 1877, 878 ships, of 41,670 tons, entered and cleared. Pop. '71, 4,403.

WOODBURY, a co. in w. Iowa, bordering on Nebraska, having the Missouri and Sioux rivers for its w. boundary, drained by the Little Sioux and other rivers; 870 sq.m.; pop. '80, 14,997—11,952 of American birth, 203 colored, Co. seat, Sioux City.

WOODBURY, DANIEL PHINEAS, 1812-64; b. N. H.; graduated at West Point, 1836; was commissioned in the artillery, and was soon transferred to the engineer corps. He was employed in constructing fortifications in the west and at Tortugas and Key West. In '361 he did valuable service in fortifying Washington and in the engineering works of the Potomac army; and later in the war was in great part superintendent of the engineering operations against Yorktown and Richmond. He was made brig.gen. for gallantry in throwing bridges across the Rappahannock in face of the enemy. In 1863 he was made commandant of Key West and there died from yellow fever.

WOODBURY, ISAAC BEVERLY, 1819-58; b. Mass.; studied music, became a well-known composer, and compiled the *Anthem*, *Dulcimer*, *Cythara*, and the *New Lute of Zion*, all collections of church music. He was for some years editor of the *Musical Review* and the *Musical Pioneer*, both published in New York.

WOODBURY, LEVI, 1789-1851; b. N. H.; graduated at Dartmouth college, 1809, and was called to the bar in 1812. For the next 4 years he practiced his profession at Francestown, N. H. In 1816 he was elected clerk of the state senate, and near the close of the year he received an appointment as judge of the state superior court. He settled in Portsmouth in 1819, was elected governor of the state in 1823, and in 1825 was speaker of the lower house of the legislature. The same year he was elected a U.S. senator. At

the expiration of his term, Jackson called him to the cabinet as secretary of the navy. He was transferred to the treasury department in 1834, and remained there till the whigs came into power in 1841. In that year he was again elected to the U. S. senate, from which he resigned in 1845, to accept the place of an associate justice of the U. S. supreme court, succeeding Joseph Story. His *Political, Judicial, and Literary Writings* were published in 1852. He was among the ablest democratic statesmen.

WOODBURY PROCESS. See POSITIVE PRINTING.

WOOD-CARVING is probably the oldest branch of art. Apparently the first weapon was a club, and the first attempt at decoration was some scratching or carving on it. Among the Egyptians, Greeks, and Romans it was much practiced. As a branch of Christian art it was one of the earliest, and attained a high development in the 15th century. It greatly declined during the last century, but has again revived, and promises to attain great importance. The wood-carvers of Great Britain have shown great capabilities, but hitherto have lavished too much care upon fineness of finish rather than on the artistic excellence of their designs.

WOOD-CHARCOAL is the most important, although not the purest, kind of charcoal. Wood consists of carbon, hydrogen, and oxygen, the last two being in the proportion to form water. When heated in the open air, it burns completely away, with the exception of a small white ash; but if the supply of air be limited, only the more volatile matters burn away, and most of the carbon remains. This is the principle of the process of charcoal burning in countries where wood is abundant, as, for example, in the Harz mountains. "A number of billets of wood are built up vertically in two or three rows into a large conical heap, which is covered over with turf or moistened charcoal-ash, holes being left at the bottom for the air to get in. A hollow space is also left in the middle of the heap, to serve as a flue for the gaseous matters which are evolved. The heap is set on fire by throwing burning pieces of wood into the central opening, near the top of which, however, a kind of grate, made of billets of wood, is placed, to prevent the burning fuel from falling at once to the bottom. The combustion then proceeds gradually from the top to the bottom, and from the center to the outside of the heap; and as the central portions burn away, fresh wood is continually thrown in at the top, so as to keep the heap quite full. The appearance of the smoke shows how the combustion is proceeding: when it is going on properly, the smoke is thick and white; if it becomes thin, and especially if a blue flame appears, it is a sign that the wood is burning away too fast, and the combustion must then be checked, by partially stopping up the holes at the bottom, or by heaping fresh ashes on the top and sides, and pressing them down well, so as to diminish the draught. As soon as the combustion is completed, the heap is completely covered with turf or ashes, and left to cool for two or three days. It is then taken to pieces, and the portions still hot are cooled by throwing water or sand upon them: 100 parts of wood yield on the average from 61 to 65 parts by measure, or 24 parts by weight of charcoal."—Watts's *Dictionary of Chemistry*, vol. i. p. 759. The charcoal thus prepared is the best suited for fuel. In England, a large quantity of charcoal is obtained in the dry distillation of wood in cast-iron cylinders, for the preparation of crude acetic acid. The charcoal thus prepared is preferable for making gunpowder, but is inferior for other purposes. A peculiar kind of charcoal of a reddish-brown color, and hence termed *charbon rouge*, is prepared in France for the manufacture of the gunpowder used for sporting purposes, by subjecting wood in iron cylinders to the action of superheated steam under a pressure of two atmospheres. Powder made with this charcoal absorbs moisture more rapidly than ordinary gunpowder.

The general properties of wood-charcoal are, that it is black and brittle, and retains the form of the wood from which it was derived; it is insoluble in water, infusible and non-volatile in the most intense heat; its power of condensing gases is noticed in the article on that subject; and from its power of destroying bad smells, it has been regarded as possessing considerable antiseptic properties. It is frequently stated that charcoal is a bad conductor of heat, but a good conductor of electricity; these properties depend upon the nature of the charcoal, the lighter wood, such as willow, yielding a porous charcoal, with little power of conducting heat or electricity; while boxwood yields a very compact charcoal, which is a good conductor of heat and electricity, and is admirably adapted for the exhibition of the electric light. Charcoal never consists entirely of pure carbon, the degree of purity varying directly with the temperature; thus, charcoal charred at 480° contains 65 per cent of carbon, while that charred at 750° contains 80, and that charred at 2,730° contains 96; but the loss of charcoal occasioned by these high temperatures is very great, the three percentages of charcoal corresponding to these temperatures being 50, 20, and 15.

The uses of wood-charcoal are numerous and extensive. It is very largely employed as a fuel, taking the same place in many countries that coal occupies here. From its being proof against all ordinary chemical agencies, "a superficial charring is frequently resorted to, with the view to protect wood from decay, as in the case of piles which are driven into mud or into the beds of rivers to serve as foundations. For the same reason, it is a common practice to char the interior of tubs and casks destined to hold liquids."—Miller's *Inorganic Chemistry*, 3d ed. p. 77. In a finely-divided state, it is com-

monly regarded, as has been already stated, as an antiseptic; and there is no doubt that the offensive effluvia from animal matter in an advanced stage of putrefaction disappear when the putrefying substance is covered with a layer of charcoal; but in reality the decay goes on, without the emission of any odor, till at length the whole of the carbon is dissipated as carbonic acid gas, and the hydrogen as water, while the nitrogen remains as nitric acid. For these explanations we are indebted to Dr. Stenhouse, who has shown that the action consists in a rapid process of oxidation, dependent upon the power which finely-divided charcoal possesses of condensing oxygen. In a finely-divided state, charcoal not only condenses gases to a marvellous extent, but has the power of absorbing coloring matters, bitter principles, etc.; and hence it is of extensive use in the laboratory. From the rapidity of its absorbing action, "Stenhouse has proposed to use a respirator filled with charcoal to protect the mouth and nostrils in an infected atmosphere; and the employment of trays of powdered wood-charcoal in dissecting-rooms, in the wards of hospitals, and in situations where putrescent animal matter is present, is found to exert a most beneficial influence in sweetening the atmosphere, by absorbing and decomposing the offensive gases. These properties render charcoal a valuable material in the construction of filters, not only for decolorizing purposes, but likewise for assisting in purifying water for domestic use. It is now also employed most successfully to prevent the escape of noxious vapors at the ventilating openings of the sewers, as it allows the free passage of air, but condenses the offensive effluvia in its pores, where they are destroyed by a process of oxidation.—Miller, *op. cit.* p. 78. Besides its employment in the manufacture of gunpowder, it has many applications in the arts. In medicine, it is at present chiefly used to destroy fetor; for which purpose it is applied in the form of powder or poultice to gangrenous sores, phagedenic ulcers, etc.; it is also largely employed in tooth-powders, as by its mechanical action it removes incrustations, while by its chemical action it destroys fetor of the breath. In indigestion, accompanied by much flatulence, it may be given in doses of two or three teaspoonfuls suspended in water, or may be administered in the form of charcoal-biscuits. Very finely divided poplar charcoal is regarded as the best for medicinal uses.

WOOD'CHAT, *Lanius rutilus*, a bird which, notwithstanding its name, is not a species of chat, but of shrike (q.v.). Its whole length is about 7½ inches. The upper parts are mostly black, the under parts white; but there is a white spot on the wing when closed, and other small portions of the wing-feathers are white, as well as the outer tail-feathers, and there is a narrow streak of white above the base of the bill on each side; the crown of the head and nape of the neck are rich chestnut red. The woodchat is a rare bird in Britain, but is abundant in the southern parts of Europe. It may be regarded as an African bird, being found from the Mediterranean to the cape of Good Hope. In Europe it appears only as a summer visitant, but in Africa it occurs at all seasons of the year.

WOOD'CHUCK, *Arctomys monax*, a species of marmot (q.v.), inhabiting North America, from Hudson's bay to South Carolina. It is from 15 to 18 in. long, blackish or grizzled above, chestnut-red below; the form thick, the head broad and flat, with almost no apparent neck, the legs short and thick, the feet large, the tail bushy. The hair is rather soft, the whiskers long and stout. This animal digs deep holes in fields, on the sides of hills, or under rocks in woods; its burrow slants upward, so that water may not enter, and within are several compartments. It passes the winter in the burrow, in a lethargic state. The food of the woodchuck is vegetable, and it is particularly destructive to crops of red clover. It is easily tamed, and may be fed on bread, milk, and vegetables. It fights successfully with a dog of equal size. The name of groundhog is sometimes popularly given to it. Its flesh is sometimes eaten, but is rank.

WOOD'COCK, the popular name of certain birds commonly regarded as of the same genus with the snipes (q.v.), but of more bulky form than the true snipes, and having shorter and stronger legs. The Common Woodcock (*scolopax rusticola*), well known as a game-bird in Britain, and highly esteemed as a delicacy for the table, is found also in all parts of Europe and the N. of Asia. It is one of the birds of Japan. It is only a winter visitant of most parts of Britain, very rarely breeding in England, but it more frequently breeds in the northern parts of Scotland. Its summer haunts are chiefly the pine-forests of the northern parts of Europe and Asia; but in summer it inhabits higher and drier ground than in winter, when it is chiefly to be found in moist woods and swamps, seeking for worms, snails, and slugs as food, boring with its long bill in the soft ground. The quantity of food which it devours is very great; a single woodcock has been known to consume in a night more earth-worms than half filled a garden-pot of moderate size. The woodcock is about 13 in. in length; the upper parts varied with ruddy, yellowish, and ash color, finely intermingled, and marked by large black spots, the lower parts yellowish-red, with brown zigzag lines; the quills striped with red and black on the outer edge; the tail-feathers tipped with gray above and white below. The female is rather stouter and larger than the male, and sometimes attains a weight of 14 or 15 ounces. A woodcock of 27 ounces is on record. The woodcock makes its nest in warm, dry situations, on the ground, of dead leaves loosely laid together. It lays only three or four eggs of a pale yellowish or reddish-brown color. As woodcocks usually breed in very dry situations in the recesses of thick woods, the young ones would be

left to starve but for the peculiar adaptation which enables the parent to transport them to moist feeding-grounds. It was long believed that the female woodcock used only her feet for carrying her young from place to place; but Mr. Charles St. John, in his *Natural History and Sport in Moray*, says, that from close observation he found "the old woodcock carries her young, even when larger than a snipe, not in her claws, which seem quite incapable of holding up any weight, but by clasping the little bird tightly between her thighs, and so holding it tight toward her own body." The woodcock feeds chiefly by night. Great numbers sometimes appear in some parts of Britain, in their migrations. Besides falling to the gun of the sportsman, they are sometimes caught by nets placed in the tracks or open glades in woods, by which they proceed from their retreats to their feeding-grounds, and by nooses or springs set about the places which they frequent.—The AMERICAN WOODCOCK (*scelopax* or *philohela minor*) is a smaller bird than the woodcock of Europe, being only about 11 in. long; very similar in plumage and habits. Three transverse black bands mark the hinder part of the head. It is found in all parts of North America, and is greatly esteemed for the table.

WOOD DUCK, or SUMMER DUCK, the *aix sponsa*, one of the most beautiful members of the duck family (*anatide*). It is about 20 in. in length; bill shorter than head, high at the base, nail very large and hooked, lamellæ broad and distant, nostrils large and open; tail truncate at tip; head green, glossed with purple; jugulum and sides of tail purple; under parts white; sides yellowish, banded with black; primaries silver white at the tips. It ranges over most of North America, being permanent in the warmer regions, but only visiting the northern parts in summer, whence often called "summer duck." It usually builds its nest in a hollow tree, whence its name "wood duck." It frequents deep, muddy, solitary creeks and ponds in the interior. It usually lives in pairs, and there is rarely more than three or four in a flock (Wilson). It feeds on acorns, wild seeds, and insects. Its flesh is much like that of the "red-head" duck.

WOOD-ENGRAVING, or XYLOGRAPHY, the art of engraving designs on wood, differs from copper and steel-plate engraving by having the parts intended to print on the paper, in *relief*. While *plates* are printed from the engraved lines by a laborious and necessarily slow process (see ENGRAVING), wood-engravings, having the object to be represented on the surface, in the manner of a type, may be printed along with the matter it is intended to illustrate in the ordinary printing-machine. This, of course, is an important point in the illustration of books, on the grounds of cheapness and expedition. Another advantage wood-engravings possess is, that they can be multiplied to any extent by means of the stereotype (q.v.) and electrotype (q.v.) processes.

The invention of wood-engraving, like that of gunpowder, has been claimed for the Chinese, whose books have certainly been printed from engraved wood-blocks for ages. It has indeed been asserted that the art of cutting figures in relief, and printing impressions on them on paper, was known and practiced by that nation as early as the reign of the renowned emperor Wu-Wang (1120 B.C.). There is no doubt that wood-stamps were used by the ancient Egyptians and Romans for stamping bricks and other articles of clay; and that wood and metal stamps of monograms, etc., were used in various European countries, for attesting deeds and other documents, at a very early period, when the ability to write was an extraordinary accomplishment even for princes. It is not, however, until the beginning of the 15th c. that we find any evidence of the existence of wood-engraving, as we now understand it. It appears to have been used in Germany at that time for printing playing-cards and figures of saints. The earliest print of which any certain information can be obtained is in the collection of earl Spencer. It was discovered in one of the most ancient convents of Germany—the Chartrouse of Buxheim, near Memmingen in Bavaria—pasted within the cover of a Latin M.S.; it represents St. Christopher carrying the infant Saviour across the sea, and is dated 1423. It is a work of some merit, notwithstanding its apparent roughness; the infant Saviour and the drapery of the saint being drawn with considerable skill and vigor. The inscription at the bottom has been thus translated: "In whichever day thou seest the likeness of St. Christopher, in that same day thou wilt, at least, from death no evil blow incur—1423." Shortly afterward, a series of books, printed entirely from wood-engravings, called block-books, were issued. They consisted principally of religious subjects, with short descriptions engraved on the same block. The most important of them were the *Apocalypsis, sive Historia Sancti Johannis*; the *Historia Virginis ex Cantico Canticorum*; and the *Biblia Pauperum*, the last containing representations of some of the principal passages of the Old and New Testaments, with explanatory texts. The illustrations, of which Mr. Jackson, in his treatise on the *History and Practice of Wood-engraving*, gives an elaborate account and several specimens, seem to be drawn with a supreme contempt for perspective and proportion, but bear evidence of the draperies, and hands and faces, having been carefully studied. One of the cuts in the *Apocalypsis* represents St. John preaching to three men and a woman, with the inscription, *Conversi ab idolis, per predicationem beati Johannis Drusiana et ceteri* (By the preaching of St. John, Druciana and others are withdrawn from their idols). Fig. 1. from the *Biblia Pauperum*, is curious as showing the general manner of representing the creation of Eve during the 15th c., the same subject frequently occurring previous to 1500. Both have the appearance of careful drawings "spoiled in the engraving." Previous to the invention of movable types, whole books

of text were also engraved on wood, and the impressions had evidently been taken by *rubbing* on the back of the paper, instead of steady pressure, as in the printing-press, the ink used being some kind of distemper color.

The Psalter printed by Faust and Schöffer at Mentz in 1457 (see GUTTENBERG), is illustrated with initial letters engraved on wood, and printed in two colors, blue and red, which Mr. Jackson considers "the most beautiful specimens of this kind of ornament which the united efforts of the wood-engraver and the pressman have produced. They have been imitated in modern times, but not excelled." It is worthy of note, that although printed upward of 400 years ago, the freshness and purity of the colors remain unimpaired.

As printing spread, the publication of illustrated books became general in Germany and Italy, and reached England in 1476; in which year Caxton (q.v.) published the second edition of the *Game and Playe of the Chesse*, with figures of the different pieces. They are very rude, compared with the earlier German works. An engraving known as the "Knight," is interesting as one of the first wood-engravings executed in this country; several works followed, all, however, in the same rude manner. The first attempt at something finer than simple lines appears in the frontispiece to the Latin edition of Breydenbach's *Travels*, printed at Mentz by Erhard Reuwich, 1486. It is by an unknown artist, and is an elaborate and really very beautiful specimen of the art. It is also remarkable as being the first engraving introducing *cross-hatching* to represent dark shadows. The *Hyperboreum Poliphili*, printed at Venice by Aldus, in 1499, is worthy of mention for the extreme beauty of the designs, which have been ascribed by some authorities to Raphael, and by others to Mantegna. About the beginning of the 16th c., a complete revolution in the art of wood-engraving was accomplished by the genius of Albert Dürer. His productions exhibit not only correct drawing, but a knowledge of composition and light and shade, and attention to the rules of perspective, which, with the judicious introduction of subordinate objects, elevated them to the rank of finished pictures. Dürer, however, in common with most of the German artists of his day, paid very little attention to the propriety of costume in his religious subjects; one of his drawings in the *History of the Virgin* (1511), for instance, representing the birth of the Virgin, shows the interior of a German burgo-master's house of his own day, with a number of gossips drinking from flagons, and otherwise enjoying themselves. There has been considerable discussion as to the probability of Dürer having also engraved his drawings. Most of the best authorities on the subject, including Bartsch, Jackson, and Firmin Didot, agree in the negative. Mr. Jackson, who speaks with the experience of a practical engraver, says: "In most of the wood-cuts supposed to have been engraved by Albert Dürer, we find cross-hatching freely introduced; the readiest mode of producing effect to an artist drawing on wood with a pen or a black-lead pencil, but which, to the wood-engraver, is attended with considerable labor. Had Albert Dürer engraved his own designs, I am inclined to think that he would have endeavored to attain his object by means which were easier of execution." The reader is referred to the article DÜRER for an account of some of his numerous works. The best of Dürer's contemporary artists on wood were the painters, Hans Burgkmair (q.v.), Lucas Cranach (q.v.), and Hans Schöufflein. A series of works projected by the emperor Maximilian, including *The Adventures of Sir Iherurdank*, *The Wise King*, *The Triumphs of Maximilian*, etc., were illustrated by these artists; but they are not equal to those of Dürer.

During the first half of the 16th c., the publication of books illustrated with wood engravings still increased, and prevailed to a greater extent than at any other time, with the exception of the present day. The superiority of talent, both in drawing and engraving, however, still remained with the Germans. In France, although their figure-subjects were inferior to those of their German neighbors, their ornamental borders in prayer-books, etc., of which a great number were printed at this time, were extremely beautiful. In Italy and England the art was very far behind. The most remarkable work published at this time was the *Dance of Death* (q.v.), issued at Lyon in 1538. The original edition of this curious work contained 41 engravings, representing the struggle between Death, generally in the form of a skeleton, and different individuals, such as the pope, the emperor, a judge, monk, doctor, duchess, old man, etc. The drawings, which are characterized by great vigor and skill, are generally understood to have been executed by Hans Holbein (q.v.); but whether he also engraved them, as has been alleged, is more than doubtful. Toward the conclusion of the century, however, the art had made considerable progress in Italy, where some of the best productions of Germany were equaled, if not excelled. In England, it did not make much progress. John Day published almost the only illustrated books of the time, notably queen Elizabeth's prayer-book, which contains a tolerably well-executed portrait of her majesty. There is no certain knowledge about any of the artists or engravers, although John Day is supposed to have engraved some of his cuts himself. At this time also, the practice of printing wood-engravings in colors from different blocks became somewhat common, although the attention of artists in that line was mostly confined to ornamental subjects. From the beginning of the 17th c., the decline of wood-engraving may be dated; Germany, the cradle of the art, being the first to forsake it; the only works worthy of notice were a series of blocks on various subjects—designed by Rabens, and engraved by Christopher Jegher of Antwerp, one of the best wood-engravers of that

period—some of which are of great beauty. From this time the art fell into a state of great neglect, not, apparently, for want of engravers, for wood-cuts of a certain kind were always produced, but for want of artists able, or willing, to make drawings worthy of preservation.

Nothing particularly deserving of notice occurred until 1766, when John Michael Papillon, an enthusiastic professor of the art in France, published an elaborate history of the subject in an unsuccessful attempt to restore it to its former importance. But it was not until the genius of Thomas Bewick (q.v.) was brought to bear on it, that wood-engraving received that impetus which has made it what it now is—one of the most important of the illustrative arts. Bewick's most important works are his *Histories of British Quadrupeds* (1790) and *British Birds* (1804); all the quadrupeds, and almost all the birds were drawn and engraved by himself. The birds especially are executed with a truthfulness and skill which has rarely ever been equaled. These works are also famous for their collection of tail-pieces, which display an infinite amount of humor and pathos. One of them—a poor ewe, in the starvation of winter, picking at an old broom in front of a ruined cot—represents a scene, trifling as it seems, which tells a woful tale of suffering. He entirely abandoned the elaborate system of "cross-hatching" which prevailed so much in the works of the older engravers, and produced his light and shade by the simplest possible means.

Since Bewick's time, wood-engraving has continued to flourish without interruption. He left behind him several pupils, the most successful of whom were Nesbet, Clennell (who engraved some of the tailpieces in the *British Birds*), and William Harvey. Harvey, however, forsook the burin for the pencil; and his drawings illustrating Milton's *Paradise Lost*, Thomson's *Seasons*, etc., especially such as were engraved by John Thomson (perhaps the most skillful engraver that ever lived, and a pupil of Robert Branstion, a self-taught engraver), still retain a first-class place as specimens of wood-engraving. The establishment of the *Illustrated London News* (1842) tended greatly to familiarize the public with the beauties of wood-engraving. In the pages of that periodical appeared the first drawings on wood of Messrs. John Gilbert and Birket Foster. The spirited figure-subjects of the former, and the exquisite landscapes of the latter, have done much to raise the art to the very high place it now occupies in England.

Of late years, the art has also made very great progress in France and Germany. The style of engraving, however, is quite different from the English, so much so, that a practiced eye can distinguish a French wood-cut at a single glance. The professors of the arts of drawing and engraving on wood at the present day are so numerous, and their works generally so well known, that it would be needless, even if our space permitted, to attempt even to enumerate them.

Practice of Wood-engraving.—The wood used for engraving is boxwood, which has the closest grain of any wood hitherto discovered. It is principally imported from Turkey for the purpose, as the English box is too small to be much of use. It is cut across the grain in slices, which are dressed to the same height as type, for convenience in printing. Inferior kinds of wood, such as American rock maple, pear tree, plane-tree, etc., are used for coarser purposes; and for very large and coarse subjects, such as posting-bills, common deal is used, and cut on the *side* of the wood with chisels and gouges. When *blocks*—as the pieces of wood are termed—are required of a larger size than a few inches square, it is necessary to join two or more pieces together, as the amount of *sound* wood to be got out of even a large slice is extremely limited. There is, however, for all practical purposes, no limit to the joining process, as blocks have been printed consisting of from 50 to 100 pieces. The wood having been made very smooth on the surface, and squared to the required size, is prepared for the artist by being covered with a preparation of white (commonly water-color Chinese white); this gives a very good surface for the pencil to work on. The subject is then drawn in the ordinary way, the tints being generally washed in with India-ink, and the details filled in with pencil. When the drawing is finished, it is given to the engraver, who, previous to commencing, carefully covers the block with paper, fastened round the edges with beeswax; this is necessary to avoid rubbing the drawing out in the process. As the engraving proceeds, he gradually tears the paper off.

The tools or gravers necessary in wood-engraving are of three kinds—viz., gravers proper; tint-tools; and scoopers, or cutting-out tools for clearing out the larger pieces. They are arranged in different sizes, to suit the different portions of the work. Most engravers use a glass of slight magnifying power, more for the purpose of relieving the eyes from the strain of fixing both eyes closely on a small object, than for magnifying the work. When gas or other artificial light is used, a glass globe filled with water, slightly tinted with blue (to neutralize the reddish glare of the light), is placed between the flame and the work; this serves the double purpose of concentrating the light on the block, and keeping it out of the eyes. When the drawing is in outline, or mostly so, the engraving is very simple; the process consists of engraving a line along each side of the pencil lines, which are, of course, to be left in relief, and afterward cutting out the pieces between. It will thus be understood that every part of a woodcut which prints on the paper is the surface of the wood left untouched, and that every white part is cut or hollowed out. When it is complicated with much shading, trees, etc., it becomes much more difficult, and brings into play the artistic talents of the engraver to preserve

the proper shades, or *color*, as it is technically termed, and texture of the different objects. Some engravers of the present day are celebrated for their power of producing beautiful pictures altogether by "graver-work" from drawings made entirely with the brush. Skies and flat tints are engraved with tint-tools which, from their shape, are best adapted for cutting straight lines; and by the judicious use of the different sizes, the lines are left wider or closer, thicker or thinner, as the tint is wanted darker or lighter. As already mentioned, the tools are arranged in sizes—i.e., those for light tints are broader at the points than those for dark tints, so as to cut out more white. Trees, foregrounds, etc., are cut with *gravers*, which, as they are like a lozenge in shape, give more scope for freedom of handling.

When the drawing is all engraved, a proof is taken by inking the surface gently with printing-ink on a dabber (a ball of cotton covered with silk), and, a piece of *India-paper* being laid on it, by rubbing the paper with an instrument called a *burnisher*, until it is all printed. The engraver then sees what touching up is required—a light part to be softened here, a hard dark part to be toned down there, etc.—before it is finished and ready for the printer.

When large blocks are to be engraved, the pieces of wood are joined with screw-bolts, and the drawing prepared in the usual manner: after which the pieces can be taken separate for convenience in engraving, and also for the purpose of getting it quicker finished, by having an engraver working at each piece—a matter of some consequence in many cases, as, for example, in the large engravings in the illustrated newspapers.

As wood-engraving, however, is at the best but a slow process, it is not surprising that many attempts have been made to introduce a substitute for it. The point aimed at is to produce by some process of etching (see ENGRAVING), or otherwise, an engraving in relief, directly from the drawing of the artist, without the intervention of the engraver at all. Many processes have been invented for this purpose. The only two which deserve mention are the *graphotype process* (q.v.), and *Leitch's process*. In the former, the drawing is made on finely-prepared chalk, with silica; this hardens the lines drawn, and the soft parts are rubbed out with a brush, leaving the lines in relief. From this a stereotype is taken. In Leitch's process, the drawing is transferred to stone like an ordinary lithograph (q.v.), and a proof—printed in ink capable of resisting acid—transferred to a plate of rolled zinc, and the white parts bitten out. The drawing may also be photographed directly on the zinc. This process has been extensively applied to the reproduction of maps, etc. Compare articles PHOTOGRAPHIC ENGRAVING, PHOTOGRAPHY.

See Jackson and Chatto's *History and Practice of Wood-engraving* (new ed., Lond. 1861); Papillon's *Traité de la Gravure en Bois* (Paris, 1766); Bartsch's *Peintre-graveur*; Ottley's *Inquiry into the History of Engraving on Copper and Wood*; Firmin Didot, *Essai sur l'Histoire de la gravure sur Bois* (1853).

WOODFORD, a co. in central Illinois, bounded on the w. by the Illinois river and Peoria lake; drained by Mackinaw and Crow creeks, 520 sq.m.; pop. '80, 21,630—17,522 of American birth, 83 colored. Co. seat, Metamora.

WOODFORD, a co. in central Kentucky, having the Kentucky river for its w. and s.w. boundary, drained by the s. fork of Elkhorn creek; 250 sq.m.; pop. '80, 11,860—11,575 of American birth, 5,643 colored. Co. seat, Versailles.

WOODFORD, JAMES RUSSELL, D.D.; b. England, 1820; graduated at Pembroke college, Cambridge, 1842, with high honors. He took orders, held livings at Easton and Kempford, became an honorary canon in Christ-church, Oxford, 1867, was select preacher to the university at Cambridge in 1864, 1867, and 1873, and was consecrated bishop of Ely, 1873. Dr. Woodford has published several collections of sermons and lectures.

WOODFORD, STEWART L., LL.D.; b. N. Y., 1835; graduated at Columbia college, 1854; became a lawyer, and in 1861 was made assistant U.S. district attorney. From 1862 to 1865 he served in the army, reaching the rank of col. and brevet brig.gen. In 1866 he was elected lieut.gov. of New York, but 4 years later was defeated when republican candidate for governor. He was a member of congress, 1872-74; and in 1877 was appointed U.S. district attorney for New York by pres. Hayes, and in 1881 was re-appointed by pres. Garfield. He is an excellent speaker on political and financial subjects. He is a trustee of Cornell university.

WOODFORD, WILLIAM, 1735-80; b. Va. In the French and Indian wars he distinguished himself by gallant conduct. In 1775 he was made col. of a Virginia regiment and had chief command at the victory of Great Bridge. He was present at Brandywine and at the siege of Charlestown was taken prisoner.

WOODHOUSE, ROBERT, 1773-1827; b. England; educated at Cambridge, where he was appointed fellow in 1798, prof. of mathematics in 1820, prof. of astronomy and experimental philosophy in 1822, and director of the observatory in 1824. Among his works which had much influence on mathematical studies are *Plane and Spherical Trigonometry* (1809), and *A Treatise on Astronomy* (1818-23).

WOODHULL, NATHANIEL, 1722-76; b. N. Y.; a soldier in the French war, 1755-63, and col. of a regiment in Amherst's army. He was a member of the N. Y. legislature, 1769-76, and a warm advocate of the patriotic side in the disputes then in progress between the colonists and the mother country. He was president of the N. Y. provincial congress, when the British invaded Long Island, and at once took command of the militia. Soon after the battle of Long Island, he was surprised by some light horse troops, who killed him after he had surrendered.

WOOD-LOUSE *Oniscus*, a Linnaean genus of crustacea, now forming the family *oniscidae*, of the order *isopoda*. The antennae are four in number, but two of them are very short, consisting of two joints at most; the other two are long and slender. The tail is very short, but is composed of six segments. Wood-lice are terrestrial, and the respiratory organs are completely infolded by plates developed from the abdominal members; the anterior plates being perforated by a row of small holes, through which the air has access to the gills. They frequent damp situations, and are generally found in dark and concealed places, under stones, in holes of walls, under the decaying bark of trees, etc. They feed on decaying animal and vegetable matter. They run with some celerity when apprehensive of danger, and sometimes also roll themselves up into a ball, so as to exhibit only the plates of the back. The eggs are inclosed in a pectoral pouch. The common wood-louse (*O. asellus*) is very abundant in Britain, and is to be found in almost every locality suitable for it. It is popularly known in Scotland by the name of *slater*.

WOOD OIL, the name commonly given by Europeans in India to a balsamic fluid, not really an oil, obtained from the trunks of trees chiefly of the order *dipterocarpaceae* (q.v.). The wood oils of Indian commerce are generally named from the countries or places from which they are brought, and it is not yet known what trees yield particular kinds, although it is certain that most of them are produced by species of *dipterocarpus*. The name *gargina balsam*, or *goorjun balsam*, is frequently given to one of the most common kinds, the produce of the goorjun tree, *dipterocarpus turbinatus*, and other species of *dipterocarpus*. Wood-oil is produced chiefly on the Burmese coast, and in the more southern and eastern regions. It is obtained by tapping the tree, and applying heat to the incision; or by felling the tree, cutting a hole in the trunk, and kindling a fire in it, a groove being made for the exuded fluid to flow into pots placed to receive it. The trees which produce it being often very large, a single tree sometimes produces seven tons of oil. Wood-oil is used in medicine as a substitute for copaiva (q.v.), and in the arts as a varnish, often in combination with colored pigments, and even as a substitute for tar in paying the seams of shipping. It is very effectual in preserving timber from the attacks of white ants. It is sometimes used in making lithographic inks. Wood-oil has a fine aromatic odor, resembling that of cedar. When allowed to remain at rest for some time, it separates into two layers, the upper consisting of a clear chestnut-colored liquid balsam, and the lower a kind of resin in flakes. It is, of course, this resinous part only which remains when it is used as a varnish, and the varnish has dried.

WOOD PECKER, *Picus*, a Linnaean genus of birds, now divided into a number of genera, and belonging to the family *picidae*, of the order *scansores*. The toes are in pairs, two before and two behind, with sharp strong claws; the bill is rather long, straight, and wedge-shaped, with a hard tip, the tip and sides compressed; the tail is usually lengthened and rigid, although in some it is short and rounded; the vertebrae of the neck are greatly developed, and the last of the caudal vertebrae is very large, with a long ridge-like spinous process; the whole structure adapting these birds to run and climb with the greatest facility on the stems and branches of trees, in which they aid themselves by the tail, like creepers (q.v.), and to seek their food, which consists chiefly of insects and their larvae, by digging into the bark and wood of trees with their bill. In addition to the particulars already noticed, they have the tongue fitted to serve as an important instrument in obtaining their food; the branches of the hyoid bone being greatly elongated backward, and in front moving as in a sheath; a peculiar arrangement and development of muscles enabling them to extend the tongue far beyond the bill; its tip being horny, and furnished with barbed filaments, while its surface is covered with a glutinous saliva, secreted by two large glands. Their powers of flight are very moderate, and the keel of the breast-bone is small. The barbets (q.v.) and wrynecks (q.v.) are referred to the family *picidae*. Woodpeckers are diffused over almost all parts of the globe, but abound chiefly in warm countries. The species are very numerous. They are mostly solitary in their habits, and live in the depths of forests. They feed in part on fruits and seeds as well as on insects; but much of their time is spent in pursuit of these, and they may be heard at a considerable distance, tapping the wood of trees with their bill, to discover the place where an insect is lodged, and to get at it when discovered. The common notion, that they are very injurious to trees, is erroneous, as they do more good by preventing the ravages of insects than harm by their pecking. They strike out chips of wood with their strong bill, and in this way enlarge holes in decayed parts of trees for a roosting-place or a nest, carrying away the chips to a distance, especially in the case of a nest, as if for precaution that it may not be discovered. The nest consists of a mere hole in a tree, perhaps with a few chips in the bottom of it, but with no other lining. The plumage of woodpeckers is generally of strongly con-

trasted colors, black and white, or green and yellow, with red marks about the head. There are several well-marked groups of wood-peckers, differing in form, plumage, and habits, which also are of different geographic distribution, some of them being entirely, and some chiefly, confined to particular parts of the world.

Only four species are found in Britain, and one of them, the GREAT BLACK WOODPECKER (*picus* or *dryocopus martius*), is of rare occurrence. It is about sixteen inches long; black, with a red cap on the head. It is found in the pine-forests of many parts of Europe.—The GREAT SPOTTED WOODPECKER (*P. major*), also called FRENCH PIE and WOOD PIE, is not uncommon in some parts of England, but is rare in Scotland. It is found on the continent of Europe from Norway to the Mediterranean. It is about nine inches and a half in length. The color is black, varied with white, the under parts grayish-white; the back of the head in the male bright scarlet. The LESSER SPOTTED WOODPECKER (*P. minor*) is not uncommon in the s. of England. Its whole length is about five inches and three-quarters. It is widely distributed in Europe and the n. of Asia. Its colors are similar to those of the last species, but differently arranged. It is frequently to be seen searching for insects on the moss-covered branches of orchard trees.—The most plentiful of all the British species of woodpecker is the GREEN WOODPECKER (*picus* or *gecinus viridis*). It is found in the wooded parts of Scotland as well as in England, but is rare in Ireland. It is common on the continent of Europe from Scandinavia to the furthest south. It is about thirteen inches in length; and is mostly of a dark-green color, tinged with yellow; the feathers over the nostrils and round the eye, black; the crown and back of the head, bright scarlet, a black mustache extending backward and downward from the base of the lower mandible, with a brilliant scarlet patch along the middle of it; the edges and tips of the wings spotted, black and white. It chiefly inhabits elm and ash trees, making its roosting-place and nest in them in the manner already described. Among its popular English names are *woodspite*, *yaffle*, *whe-tile*, and *woodcall*. The green woodpecker belongs to a group or section of woodpeckers entirely confined to the old continent, and which are more frequently to be seen seeking their food on the ground than the more typical species. The American species of woodpecker are very numerous, and some of them, which want of space prevents us from describing, are among the best-known birds of the United States and Canada; as the HAIRY WOODPECKER (*picus villosus*), which is to be found at all seasons in woods, orchards, fields, and even in the midst of cities, visiting farm-yards in winter to pick up grain—a lively, noisy, and active bird; the IVORY-BILLED WOODPECKER (*picus or cam pelpotulus principalis*), which inhabits the southern parts of the United States and Mexico: is called *carpentero* by the Spaniards, from the great quantity of chips which it makes; and is valued by the Indians for its ivory-like bill and scarlet crest, which they use as ornaments. The RED-HEADED WOODPECKER (*picus* or *melanerpes erythrocephalus*) is very common in most parts of North America, and feeds much upon fruits and upon young heads of Indian corn, so that a reward is given for killing it. The largest species in the northern parts of America is the BLACK WOODPECKER, or LOG-CKCK (*picus* or *dryotomus pileatus*), which is about eighteen inches long, the general color greenish-black, with stripes of white from the eyes along the neck and sides.—The genus *picumnus* is the type of a group of *picidae* called *piculets*, very small birds, with bill hard at the tip, broad rounded wings, and a short tail with broad rounded feathers, not used for support, departing from the typical characters of the family. They inhabit the warm parts of South America, India, and the eastern archipelago.

WOOD-PRESERVING. Several processes have been employed of late years for the purpose of preventing the decay of wood from damp, atmospheric action, or the destructive operations of animals and parasitic plants. The principle in all has been the same—viz., the injection into the vessels of the wood of some mineral material, which, by combining with the albumen of the woody tissue, prevents its decomposition, or gives it a poisonous character. The chief of the methods in use are that called kyanizing (q.v.), creosoting, in which the preserving material is the so-called creosote, or crude carbolic acid of coal-tar, and the Boncherie process, chiefly used on the continent. In this last a solution of sulphate of copper is used. While the tree is still growing the head of the tree is cut off, and the top of the bare stem is hollowed into the form of a bowl, which is then filled with the solution, which is afterward supplied as required. The liquid penetrates downward, killing the tree as it goes, but giving to the wood a most remarkable degree of durability, particularly when applied to such purposes as railway sleepers, etc.

WOODRUFF. *Asperula*, a genus of plants of the natural order *rubiacæ*, containing a number of annual and perennial species, with whorled leaves, natives of the northern parts of the old world, and distinguished by a funnel-shaped or bell-shaped corolla, a bifid style, capitate stigma, and dry didymous fruit. The SWEET WOODRUFF (*A. odorata*) is common in shady woods in Britain and all parts of Europe. It has a creeping root, a stem 5 to 10 in. long, weak and sub-erect, four or five whorls of lanceolate leaves, 6 to 8 in the whorl, rough at the edge and keel, and small white flowers. The plant, when dried, has a very agreeable fragrance, similar to that of *anthoxanthum odoratum* (see VERNAL GRASS) under similar circumstances. It forms an agreeable herb-tea, and enters into the composition of the popular *May-drink* of the Germans.—DYER'S WOOD-

RUFF (*A. tinctoria*) is a native of the continent of Europe and of Siberia, a perennial, with reclining stems about a foot in length, whorls of six or four linear leaves, the upper leaves opposite, the flowers whitish. The root is used in Dalmatia and elsewhere instead of madder; but the crop obtained from a field is inferior in quantity to that of madder.

WOODRUFF, a co. in central Arkansas, having the White river for its w. boundary; drained by the Cache; 530 sq.m.; pop. '80, 8,646—8,582 of American birth, 4,483 colored. Co. seat, Augusta.

WOOD-RUSH. See LUZULA, *ante*.

WOODS, CHARLES R., b. Ohio, 1831; educated at West Point, and appointed to the engineers. He was stationed on the frontier or in garrison till 1861. As col. of an Ohio regiment, he fought through the West Virginia campaign, and was at fort Donelson, Shiloh, the siege of Corinth, and the siege of Vicksburg. He was made brig.gen. of volunteers in 1863, participated in Sherman's campaign, and was retired from the service in 1874, with the brevet rank of maj. gen.

WOODS, LEONARD, D.D., 1774-1854; b. Mass.; graduated Harvard college, 1796; ordained pastor of Congregational church at Newbury, 1798; contributed controversial papers to the *Panoplist*, 1805, in defense of Calvinism; professor of theology, Andover seminary, 1807-46. He was prominent in the formation of the Am. tract society, Am. education society, and the Am. board of foreign missions; was the champion of Calvinism in opposition to Unitarian theology. He published *Letters to Unitarians; Reply to Ware; Letters to Rev. N. W. Taylor; Lectures on Inspiration; Memoirs of American Missionaries; Infant Baptism; Lectures on Church Government; Lectures on Swedenborgianism; Doctrine of Perfection; History of Andover Seminary*. His collected works were published in 5 vols.

WOODS, LEONARD, JR., D.D., LL.D., 1807-78; b. Mass.; graduated Union college, 1827; ordained 1833; tutor Andover theological seminary, 1831; professor of sacred literature Bangor theological seminary, 1836-39; edited *Literary and Theological Review*, New York, 1834-37; president Bowdoin college, 1839-66; visited Europe in 1867 to obtain materials for a history of Maine. He published *Address on Life and Character of Parker Cleaveland; The Opening of the New Hall of the Medical School*; translated Knapp's *Theology*, and De Maister's *General Principles of Political Constitutions*. He was a broad and vigorous thinker, with large learning and literary taste.

WOODS AND FORESTS, AND LAND REVENUES, COMMISSIONERS OF. In ancient times, the principal part of the royal revenues of England consisted of the rents and profits of the crown lands, which were composed of numerous lordships and honors, with forests and chasers. The demesne lands reserved to the crown at the conquest were at one time very extensive; but while they were often added to by forfeitures, they were also so largely encroached on by grants to subjects, that from the 12th to the 14th centuries, parliament had often to interpose to compel the resumption of grants thus made. The confiscation of the property of the monasteries under Henry VIII., greatly increased the real estate of the crown; and, notwithstanding alienations by that monarch and by queen Elizabeth, who disposed of part of the royal domains, to avoid application to parliament for supplies, the crown, at the accession of James VI., owned very extensive estates all over England. The profusion, however, of James and his successors reduced the royal estates to insignificance, and no effectual restraint was imposed on their dilapidation until statute 1 Anne, c. 1, prohibiting all alienations of the crown-lands, except by leases not exceeding 31 years, or three lives. From the reign of Henry VIII. to that of George III., the crown revenues were subjected to repeated changes of management; and under George III., the system was first introduced of surrendering the greater part of them to be consolidated with the rest of the public revenue, out of which the royal civil list is paid. The modern administration of the land revenues of the crown is founded on a statute of 1810, establishing a board of not less than two, or more than three commissioners, called "the commissioners of his majesty's woods, forests, and land revenues." The law relating to the management of the crown-lands was consolidated by act 10 Geo. IV. c. 50, which, repealing a number of previous enactments on the subject, placed the whole hereditaments of the crown in England, Wales, and Ireland, except advowsons and vicarages, under the management of the commissioners of woods and forests, with large power of selling and leasing them; and provided that the annual land revenues should, subject to certain deductions, be carried to the consolidated fund during the king's life. This transfer to the consolidated fund, the result of a special agreement terminating with the life of the sovereign, has been renewed with his successors. Act 2 and 3 Will IV. c. 112, empowered the treasury to transfer to the commissioners of woods and forests the management of the crown-lands of Scotland.

A large addition was made to the duties of the commissioners of woods and forest by 2 Will. IV. c. 1, which, abolishing the office of surveyor-general of his majesty's public works and buildings, intrusted to them the management of the public works. This union, however, was afterward considered inexpedient, and act 14 and 15 Vict. c. 42, removed the department of public works from the woods and forests, and placed it under separate control. The act 29 and 30 Vict. c. 62, introduced various alterations

in the details of management. The commissioners of woods and forests act under the control of the treasury, and are required to transmit annual accounts of the receipt and expenditure of their department, to be audited by the commissioners for auditing public accounts. The yearly receipts from this source amount to about £375,000. See WORKS, BOARD OF.

WOODSON, a co. in s.e. Kansas, drained by the Neosho river, Owl and Turkey creeks, and the Verdigris river in the s.w.; 504 sq. m.; pop. '80, 6,535—5,916 of American birth, 67 colored. Co. seat, Yates Centre.

WOOD-SORREL. See OXALIDEÆ.

WOODSTOCK, a t. in Windham co., Conn., consisting of six villages—Woodstock, Woodstock Valley, East, West, North, and South Woodstock; pop. '80, 2,639.

WOODSTOCK, a small town and parliamentary borough, Oxfordshire, 8 m. n.n.w. of the city of Oxford. The pop. (1871) of the borough (which includes several adjacent villages and hamlets) is 7,477, and is much larger than that of the town, which contains only 1200 inhabitants. The manufacture of fawn-skin gloves gives employment to about 1200 persons, residing in the town and neighboring villages. Woodstock, or rather Old Woodstock, a little to the north of the present town, was a residence of the early English kings; but no remains of the ancient palace exist. Edward, the black prince, was born here; Elizabeth was held prisoner by her sister Mary; and Chaucer resided here for some time. Woodstock is also famous in connection with Fair Rosamond, the celebrated mistress of Henry II. It is now doubted, however, if the labyrinth or maze which Henry is said to have constructed for her behoof ever existed. In the immediate vicinity is Blenheim park, the seat of the duke of Marlborough. Woodstock returns one member to the house of commons.

WOOD-SWALLOW. *Artamus*, a genus of birds, resembling swallows in many of their habits, but differing in the structure of their bills and feet, and belonging to the family of *ampelide*, or chattering (q. v.). The bill is very broad at the base, and arched; the upper mandible thick, but not ridged; the gape furnished with bristles; the nostrils wide apart, naked; the feet short and strong; the wings very long and pointed; the tail short. Their flight is rapid. Their food consists chiefly of seeds. They are natives of the East Indies and of Australia. An Australian species (*A. sordidus*) is sometimes seen in great numbers, and is remarkable for the habit of suspending itself, in clusters on dead branches, like a swarm of bees, one bird clinging to another, so that as many thus hang together as would fill a bushel.

WOODWARD, BERNARD BOLINGBROKE, 1816-69; b. England; tutor in a private school; clerk in a banking house; studied theology in the Independent college, Highbury, 1839, 1840; graduated London university, 1841; minister of an Independent church. Wortwell; aided in preparing a new edition of Barclay's *Universal Gazetteer*; settled in London and wrote for the press. He published *History of Wales from the Earliest Times to its Final Incorporation with England*; *History of the United States of N. America to the end of the Administration of President Polk*; *First Lessons on the English Reformation*; *Windsor Castle, Thirty Photographs printed in Permanent Colors with Descriptive Text*.

WOODWARD, SAMUEL PECKWORTH, PH.D., 1821-65; b. England; educated at the London university. From 1839 to 1845 he was sub-curator of the London geological society; from 1845 to 1848 professor of botany and geology in the Cirencester agricultural college; and for three years assistant in geology and mineralogy at the British museum. He published many scientific papers, a geological map of England and Wales, and *A Manual of Mollusca, or a Rudimentary Treatise on Recent and Fossil Shells*.

WOODWAXEN. See WOOD, *ante*; DYERS' BROOM.

WOODWORTH, SAMUEL, 1785-1842; b. Mass. He learned the printer's trade, and in 1823 was joint owner with George P. Morris of the *New York Mirror*. He wrote several poems, of which one, the *Old Oakon Bucket*, has gained popular appreciation. In 1861 a collection of his poems was published.

WOOL is a variety of hair (q. v.). The term hair is applied, in ordinary language, to a smooth, straight-surfaced filament like human or horse hair, without serrations of any kind on its surface. Wool, on the other hand, is always more or less waved; besides which, externally each woolly filament is seen under the microscope to be covered with scales overlying each other, and projecting wherever a bend occurs in the fiber. Upon minute points of difference the value of wool chiefly depends, especially with regard to the great variety of its applications. If each fiber were straight and smooth, as in the case of hair, it would not retain the twisted state given to it by spinning, but would rapidly untwist when relieved from the force used in spinning; but the wavy condition causes the fibers to become entangled with each other, and the little projecting points of the scales hook into each other, and hold the fibers in close contact. Moreover, the deeper these scales fit into one another, the closer becomes the structure of the thread, and consequently of the cloth made of it. This gives to wool the quality of *felting* (q. v.). By combing, or drawing the wool through combs with angular metal teeth, some of the scales are removed, and the points of many more are broken off, so that wool which has been combed has less of the felting property, and is consequently better adapted for

light fabrics; and yarn made of such wool is called *worsted*, and the cloths made of it *worsted goods*. But such is the variety of wools obtained by careful breeding and selection, that these differences can be got without combing, some wools being found to have naturally fewer serratures, and a less wavy structure, than others. These are consequently kept separate, and are called *combing-wools*; whilst those which are much waved, and have many serratures, are called *carding-wools*, from their being simply prepared for spinning by carding-machines. The serratures or points of the scales are exceedingly small, and require the aid of a good microscope to see them. They vary from 1200 up to 3,000 to an inch.

Wool is the most important of all animal substances used in manufactures, and ranks next to cotton as a raw material for textile fabrics. Its use as a substance for clothing is almost universal in the temperate regions of the globe.

Previous to 1791 British woolen cloths were made almost wholly of native-grown wools. At that time the whole supply of the country could not have much exceeded 100,000,000 lbs. The merino wool of Spain then began to displace them in the best kind of goods, and the imports from that country reached their maximum in 1805, being in that year 7,000,000 lbs. Before 1820 the German wool had begun to supersede the Spanish, and was imported largely till 1841. After that, the cheaper wool of the British colonies to a great extent took the place of the German, and the latter is now chiefly used for only the finest cloths.

Wool varies in character according to the peculiar breed of sheep which yields it, and also with the nature of the soil, food, shelter, and climate. In a wool of first-rate quality, the fibers are fine, soft, elastic, sound, of good color, and free from deleterious or troublesome impurities: the commercial value of any sample depends, therefore, upon the extent to which it possesses these properties. If it be a combing wool, it will also depend upon its length of staple.

For technical purposes, shorn fleeces are divided into two classes, one called *hogs* or *tegs*, the other *wethers* or *ewes*. The former are the first fleeces shorn from the sheep, the latter are those of the second and succeeding years; but the meaning of these terms varies a little in different districts. The fleece of yearlings are, as a rule, longer in the staple, and otherwise of superior quality to the wool of older animals. In the s. of England, it is customary to clip lambs, and the wool so obtained is called *shorn lamb's wool*. Wool taken from the skins of slaughtered sheep is called *skin-wool* or *pelt-wool*, and is of a more variable quality than fleece-wool, on account of its being obtained in all stages of growth.

As long-stapled wools are used for worsted goods, and stapled for woolen goods, the various breeds which yield these two leading kinds are naturally divided into the long-wooled and short-wooled classes of sheep. The Lincoln, the Leicester, and the Cotswold breeds are considered good types of the former; and the Down, the Welsh, and the Shetland breeds, of the latter.

The following brief notice of the characteristic properties of the various native wools is founded upon the description given to them in the jury report of the international exhibition of 1862, class IV.

Of the "long wools," the *Lincoln* has greatly risen in value of late years. It is coarse, of great length, and silky in appearance, so that it is well adapted for "luster" goods, in imitation of alpaca fabrics. *Leicester* wool is highly esteemed for combing. It is rather finer in the hair, but not usually so soft and silky in the staple as the last. *Cotswold* wool is similar to the Leicester, but somewhat harsher. It is not suited for luster goods. *Highland* wool is long stapled, and of coarse quality, but known to be susceptible of great improvements. The practice of "smearing" greatly depreciates its value. It is chiefly used for the coarsest kinds of woolen fabrics, as carpets, rugs, and similar articles. It is also used for Scotch blankets.

Of the "short wools," the different breeds of Down's partake very much of the same characters, but soil and climates so far affect them. The *South Down* is a short-stapled, small-haired wool, the longer qualities of which are put aside for combing purposes, and the shorter for the manufacture of light woolen goods, such as flannel. The *Hampshire Down* differs from it in being coarser, and in having the staples usually longer. The *Oxford Down*, again, exceeds the last in length and coarseness of staple. The *Norfolk Down*, on the other hand, when clean, is of a very fine and valuable character. The *Shropshire Down* is a breed increasing in importance, and is longer in the staple, and has more luster than any of the other Down breeds. *Ryeland's* wool is fine and short, but the breed is nearly extinct. The *Welsh* and *Shetland* wools have a hair-like texture, deficient in the spiral form, upon which depends the relative value of high-class wools. They are only suited for goods where the properties of shrinking and felting are not required. Shetland wool is obtained of various natural tints, which enables it to be used for producing different patterns without dyeing.

Of the intermediate wools, *Dorset* is clean, soft, and rather longer, and not quite so fine in the staple as the Down breeds. The *Cheriot* has increased very much of late years in public estimation. It is a small fine-haired wool, of medium length, and is suitable for woolen and worsted purposes, for which it is largely used.

Some of the British colonies are very important wool-producing countries, Australia in this respect standing far in advance of all other countries whatever. The Australian

wool has in general a beautiful, short, silky staple, well adapted for the manufacture of soft, pliable, and elastic fabrics. All the settled districts of this continent have been found well adapted to the growth of fine-wooled sheep, and the extraordinary increase in the flocks forms one of the most remarkable features of the colony. The breed has sprung from three merino rams and five ewes taken out by capt. McArthur in 1797. The alpaca wool grown in Australia since the creature was introduced some years ago is of inferior quality; but this is supposed to have arisen from rearing the animals too near the coast, and hopes are now entertained of succeeding better with it inland.

The wool of Cape colony has of late years been greatly improved by the introduction of merinos, and, as will be seen from the table below, the exports from it are increasing very rapidly.

Among the imports from India, wool has of late become an important article, the quantity having risen from 2,500,000 lbs. in 1840, to 21,500,000 lbs. in 1877; but the supply is rather fluctuating. A great deal of the Indian wool is coarse and hairy, and can only be used for low-class goods. We may state here that the most costly of all wools is obtained from the Thibetan goat, and is found next the skin, under the thick hair of the animal. From it, the far-famed Cashmere shawls are made. The highest price of any quality which is sold is from 6s. to 7s. per lb. in the native markets, but the maharajah of Cashmere keeps a strict monopoly over the best kind.

Turning now to European countries, it is somewhat sad to think that Spain, the native country of the merino, which not so long ago sent all the wool for the best English cloths, has allowed its quality to degenerate, and its once large supply to dwindle away. The wool of Saxony, Silesia, and some parts of Austria, which is obtained from sheep of the merino breed, is the finest produced in any country; and notwithstanding the lower price and nearly equal quality of the Australian, German wool is still employed for the finest broadcloths, some kinds of ladies' shawls, and a few other purposes. Great attention is paid to the breeding and rearing of sheep in Germany, and large flocks are reared for their wool alone. In Austria, the number of sheep is estimated at 45,000,000, and the annual yield of wool at 100,000,000 lbs., most of it being of fine quality, and all of which is consumed in Austrian manufactures. France produces a large quantity both of fine and coarse wool. In Italy, the production of wool from mixed merino breeds has become a source of great wealth. Russia, as might be expected from its great extent, rears many qualities, from the finest merino to a very coarse kind. The wools of the remaining countries of Europe are of minor importance.

To get the total imports for each year, we would require to add the amounts from countries of lesser importance, which are not given; but in the annexed statement we give the total annual imports for the three years 1872, 1874, 1877: (1872) 392,500,925; (1874) 340,288,032; (1877) 406,369,953. For several years past, about one-third of the imported wool has been re-exported. The estimated produce of home-grown wool in 1871 and the three preceding years was as follows:

	Lbs.
1871. Total of animals slaughtered, 12,370,056, estimated at 23½ lbs. =	34,017,654
1871. Net clip of wool	144,985,712
1870. " "	149,516,679
1869. " "	155,591,096
1868. " "	165,549,735

Independently of the vast amount of home and foreign-grown wool which finds its way into our markets as wool that is in the condition fit for spinning and weaving, considerable quantities are retained on the skins, and made into rugs or mats for house and carriage use. For this purpose skins of the very best quality are chosen, and it is necessary that the wool should be very long in the staple. After being carefully curried, the long silky locks of wool are dyed usually some bright color, and combed. The skins are pared to shape, and form handsome rugs, which are not only in great favor in Britain, but are extensively imported. The chief seat of this trade is at Bermondsey, in London, but it is also carried on to a considerable extent in other parts of the kingdom. Large numbers of Astracan sheep and lamb skins, usually black, are also imported in the wool, and are dressed and used as furs, that is, for personal wear; and some of the Slink lambs' skins for this purpose fetch high prices.

We must not omit to mention that the wools of South America are now attaining great importance, as will be seen by the table below; but it is necessary to state that besides the 10,710,246 lbs. imported in 1877, there were 3,579,245 lbs. of alpaca (including llama and vicuña) wool. See ALPACA. The wool of the alpaca is very fine, from 6 to 12 in. long, of various colors, and well suited for certain kinds of goods, which are noticed under WOOLEN AND WORSTED MANUFACTURES. South American sheep's wool is of an inferior quality.

Much finer wool would be produced in Britain than is at present, if it were not that the demand for mutton, and the unfitness of the merino sheep for supplying that article of good quality, lead our farmers to choose breeds which are *primarily* mutton-producing.

The following table will show at a glance the remarkable changes which have taken place in the sources from which Great Britain has derived its supplies of wool, and also the steady increase in the aggregate quantity imported:

IMPORTS OF WOOL FROM THE PRINCIPAL COUNTRIES.

Year.	Spain.	Germany.	Australia.	South Africa.	East Indies.	South America.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1810	5,952,407	778,835	167	.....	.....	Insignificant previous to 1833.
1816	2,958,607	2,816,655	13,611	9,623	.....
1820	3,536,229	5,113,442	99,415	29,717	.....
1830	1,643,515	26,073,882	1,967,379	33,407	.....
1834	2,343,915	23,634,615	3,558,091	111,707	67,763	
1840	1,266,905	21,812,099	9,721,243	751,741	2,441,370	4,378,274
1850	440,751	9,166,731	39,018,221	5,709,529	3,473,252	5,296,648
1860	1,000,000	9,292,000	59,166,000	16,574,000	20,214,000	8,950,000
1870	25,262	4,912,600	175,081,427	32,785,271	11,143,148	12,457,631
1874	100,178	7,158,319	225,383,631	42,332,672	19,116,772	10,562,874

With respect to the wool, or woolly hair, of animals other than the sheep, which we have not already mentioned, the only one of much importance is mohair, or the wool of the Angora goat (q v.). Of this material there were about 7,000,000 lbs. imported in 1877. It is a white silky wool, with an average length of staple of from 5 to 6 inches. The demand for it is only of recent origin, and, as will be noticed in our next article, it is chiefly used for certain kinds of ladies' dresses. The hair of camels, bullocks, common goats, and several furs are also used to some extent for manufacturing purposes.

The grand total of wool, shoddy, and goats' hair employed in the woolen industries of Great Britain in 1878 cannot have been far short of 500,000,000 lbs. The total import of raw cotton in 1877 was over 1,335,000,000 lbs.; but of this, nearly 1,512,500 lbs. were re-exported.

WOOL, JOHN ELLIS, 1788-1869; b. N. Y., studied law, but in 1812 was appointed capt. in the U. S. army. In the war with Great Britain he distinguished himself at Queenstown heights, where he was wounded, and at Plattsburg. He rose through the various grades, and in 1841 reached the rank of brig. gen. In 1832 he went to Europe, studied military science, and was present at the siege of Antwerp. In the Mexican war he organized 15,000 volunteers, selected the ground for the battle of Buena Vista and was second to gen. Taylor in command. For his services he was brevetted maj.-gen. He afterward served in the Indian warfare. On the attack on fort Sumter, he reinforced fortress Monroe and prevented its seizure. He was made commander of the department of Virginia and in 1862 captured the city of Norfolk. In the same year he became a maj.-gen. In 1863 he commanded the department of the east.

WOOLEN AND WORSTED MANUFACTURES. The spinning and weaving of wool was practiced from an early period in Asia Minor, Greece, Italy, and some other countries. It is very probable that the first lesson which our ancestors received in this art were got from the Romans after the conquest; but the origin of the manufacture as a great staple is generally supposed to date from the time of William the conqueror, when some Flemish weavers came to England, and obtained the patronage of the queen. The trade, however, fell off during the troubles of succeeding reigns. In 1331 it revived again by another supply of Dutch weavers brought over by Edward III. In 1530 the introduction of the spinning-wheel gave a new impetus to the trade. French workmen, driven to England by the revocation of the edict of Nantes in 1685, still further aided it by their skill in the making of fine cloth, and from that time to the present it has steadily prospered. It is hardly necessary to state that the woolen trade has shared, in common with other leading textile manufactures, the great advancement they have received from the spinning-jenny, the mule, and the power-loom.

There are two great classes of manufactures using wool as a raw material: in the one, where carded wool is employed, the goods are called "woolen fabrics;" in the other, where combed wool is used, the goods are called, "worsted fabrics." We shall first treat of the *woolen manufacture*.

As our articles on SPINNING and WEAVING are general, we shall here briefly state the chief stages in these processes, as applied to the manufacture of woolen cloth. A fleece of wool is first sorted by experienced sorters into several qualities, as first sort, or "pick-locks;" second sort or quality; third sort or quality; and so on. Sometimes it is only divided into three, sometimes into as many as six kinds. The "scouring" is the next step, and consists in immersing the wool in an alkaline lye, which forms a soap with the natural grease of the fleece. This of course acts as a detergent, and cleans the wool thoroughly when it is washed in water. Upon the perfection with which the scouring is performed, depends in great part the beauty of the dye. It is often dyed at this stage, and is then said to be *wool-dyed*; if not dyed till it is woven; the cloth is said to be *piece-dyed*. For some purposes, it is dyed in the yarn.

Scoured wool, whether dyed or not, next undergoes the operation of "willying." The "willy" is a machine used to cleanse the wool from dust and other loose impurities. In many cases, seeds with hooked scales like burs are so thickly entangled in the wool, that it requires to be passed through a "burring-machine," and afterward examined by "pickers." This is especially the case with South American wool, including that of the alpaca. After this, the wool is sprinkled with olive oil, which renders the fibers soft, flexible, and better fitted for later operations. The next process consists in

tearing open the matted portions, and separating the wool into small tufts by means of a machine called a *teaser*, *tucker*, or *devil*. It has a large cylinder studded over with iron pikes, which performs from 1000 to 2,000 revolutions per minute, teasing the wool as it revolves, and throwing it out like flakes of snow.

The two next operations are called *scribbling* and *carding*, and are performed by two somewhat similar machines, the essential parts of which will be understood by referring to fig. 2 in the article SPINNING. Each machine consists of a large cylinder surrounded by several small rollers, all covered with wire cards or brushes. These, acting like fine-toothed combs open out, mix, and blend the fibers into a uniform and continuous sheet or lap, in which state it leaves the *scribbler*; but in the *carder*, the sheet is at length converted into small rolls, say from a quarter to half an inch in diameter, which are afterward joined together, and form the basis of the thread. In the next machine, called the *slubbing-billy*, these rolls are drawn out, slightly twisted, and, in short, half converted into yarn. The spindles upon which these *slubs* or *slubbings* are wound pass them to the *spinning-mule*, where they are converted into finished yarn.

Comparatively recent improvements have made the operations of scribbling, carding, and slubbing continuous, mainly through the introduction of Apperly's patent feeder, and of a modification of the carding-machine called a *condenser*, which does away with the use of the slubbing-billy; so that what with the older machines is three separate processes, with the newer may be said to be only one. Each of the foregoing operations occasions a certain amount of "waste" wool, which is worked up again into inferior goods. It was, in fact, to such waste that the name *shoddy* was originally applied. In the spinning process, the warp yarns, having to bear the strain of the loom, are made in a different way from those for the weft, and they are besides hardened with size.

The difference between woolen and worsted fabrics is owing in great part to the way the yarn for each is spun. Yarn for woolen cloth is very slightly twisted, so as to leave the fibers as free as possible for the felting process; worsted yarn, on the contrary, is hard spun, and made into a much stronger thread. On account of the feebleness of woolen yarn, it is more difficult to weave it by power-looms than either worsted, cotton, linen, or silk.

Woolen cloth is now woven chiefly by power-looms. See LOOM and WEAVING. When the cloth is taken from the loom, it has a bare look, and is called the *raw thread*. It first requires to be *brayed* or *scoured*, to remove the oil added to the wool before spinning, and the size added to the warp. This is done by immersing it in some ammoniacal detergent liquid, such as urine and hog's dung, and squeezing it between rollers, or beating it in the fulling-stocks, and then rinsing it in clean water. The cloth then passes to the *burler*, who removes any knots or burls, and helps any imperfections. The next process to which it is subject is the *milling* or *fulling* and it is a very important one. In some mills this is still done by beating the cloth in the *fulling-stocks*, which are heavy wooden mallets, raised by wheels with projecting cams; but a newer *fulling-machine* has come into use, in which the cloth is felted by passing it in a confined space between heavy rollers. With either machine, a thick solution of soap is used, and in the fulling-stocks an ordinary broadcloth will take 60 hours to mill, but a considerably shorter time suffices in the fulling-machine. The result of the operation is that the fibres of wool become so interlocked—so thoroughly felted—as to leave no appearance of thread. The shrinkage of the cloth in the milling is sometimes nearly a half in the width, and about a fourth in the length. Another scouring follows the milling, and after that the nap or pile of the cloth is *raised* by teasels (q.v.). These curious thistle-like heads are set in frames, which are arranged upon a large cylinder—the whole apparatus being called a *gig-mill*. As the cylinder revolves, the spines of the teasels raise the nap, which is afterward cut by a process termed *shearing*. For this purpose, a cutting machine with spiral blades arranged round an iron cylinder, is used; and when it revolves, the spiral cutters, acting against a straight steel blade, shear off the nap of the fabric like scissors. The cloth is then boiled, or "scalded," to impart a luster to it, and to prevent spotting with rain. After this it is dyed (if this is not previously done in the wool), and finally it is pressed between polished iron plates in a powerful hydraulic press. With respect to the dyeing of black cloth, it may be as well to explain that the term *woaded colors*, so commonly used in the trade, originally meant that woad (q.v.) was used in conjunction with indigo as the basis of the color—a combination which produces the best and most durable color. Of late years, however, the name has been applied to the color of the fabric when indigo itself has been used as its basis. It is only the finest cloths that are now dyed in either of these ways—logwood, a salt of iron, and galls being much more generally employed to produce a black.

Names are given to various kinds of woolen cloths according to the style in which they are finished, the special material of which they are made, and the purpose for which they are intended. *Broadcloths* are classed into "superfines," running from 54 to 62 in. wide; "mediums," from 54 to 58 in.; "double milled," from 54 to 56 in.; and Venetians, which are twilled fabrics, from 54 to 58 inches. The general term broadcloth also includes the following varieties, which, for the most part, have less highly-finished surfaces—viz.: meltons, beaver, pilots, cloakings, china striped cloths, India cloths, elastics, lusters, and union cloths which have cotton warps and woolen wefts. *Narrow cloths*, which average about 27 in. wide, include cassimeres, a thin, fine, twilled

fabric; doeskin, also twilled, a strong, smooth finished, sometimes, treble-milled cloth, now usually dyed black for trouserings; tweeds (q.v.), which have very much taken the place of fancy doeskins; and several other varieties. Then there are special kinds both broad and narrow—such as army cloths, rifle cloths, police cloth, upholstery cloth, carriage cloth, coffin cloths, and many more. Flannels, blankets, and some kinds of shawls, are also included among woolen goods.

The public taste has changed very much of late years with respect to the finish of woolen cloths. Formerly, a firm, close, and hard fabric, with a highly-dressed or glossy surface, was in demand; now, a softer and more pliable finish, without gloss, is in favor. Foreign manufacturers think, however, that a soft, rich, elastic cloth is apt to lose in strength what it gains in appearance, and do not finish so highly as the English. The desire for fancy woollens is another marked feature of the taste of the present day, and compels manufacturers to expend considerable sums in the preparation of designs and colors. It has also led to the enlargement of old, and the establishment of new art-schools in both the woolen and worsted centers in Yorkshire.

Of all the changes, however, which the present generation has witnessed in this trade, the most remarkable is doubtless the production of cheap cloths by the use of shoddy; although cotton warps have also done much in the same direction. Prepared shoddy is obtained, for the most part, by tearing up woolen rags by a *soft*, with ten or twelve thousand iron spikes upon it, revolving inside an iron cylinder. Shoddy now enters to a greater or less extent into the composition of all but the very finest woolen cloths. It began to be used about 60 years ago, but the prejudice against it is scarcely yet overcome. In spite of this feeling, it has become so necessary that to stop the supply would be to shut one-third of the woolen mills in the kingdom. The excellent finish now given to woolen cloths containing a large proportion of shoddy, and also cloths with cotton warps, is quite surprising; and, moreover, their cheapness has brought comfortable clothing within the reach of the humblest classes. Cloths with too large an amount of shoddy in them are easily torn; but if a judicious admixture of pure wool has been employed, they wear comparatively well. Formerly, the only use of woolen rags was to make flocks for wall-papers, for saddlers' stuffing, and some minor purposes, the greater part being used as manure.

In the British islands, the various branches of the woolen manufacture are very extensively diffused. According to a factory return made in 1871, it was carried on in 22 counties of England, 12 of Wales, 27 of Scotland, and 16 of Ireland. The principal seat of the manufacture of superfine broadcloth is the west of England—Gloucestershire and Wiltshire especially—where it has existed for centuries. But Yorkshire is the great seat of the woolen manufacture, if we take in all the kinds, Leeds and Huddersfield being the great centers. One-half of all the operatives in the woolen factories of the kingdom are employed in Yorkshire, and here, too, the trade has increased most rapidly, both in the last and in the present century, owing mainly, it is believed, to the success of the manufacturers in producing cheap goods. Blankets are made chiefly at Witney, in Oxfordshire; at Dewsbury, in Yorkshire; and some places in the south of Scotland. Halifax and the surrounding district is the chief center for flannels, but they are also made chiefly in Wales. In Scotland, the woolen manufacture is a very extensive one, but it has, for the most part, been already described under **TWEEDS**.

The following statistics of the woolen industry of the United Kingdom are for the year 1875:

NUMBER AND EFFECTIVENESS OF WOOLEN FACTORIES.

	Number of Factories.	Total Number of Spindles.	Total Number of Power-looms
ENGLAND AND WALES—			
Factories employed in spinning.....	480	563,512	.....
Factories employed in weaving.....	45	.....	1,875
Factories employed in spinning and weaving.....	771	2,248,551	43,150
Factories not included in either of the above descriptions.....	187	.....	.....
Total.....	1,483	2,812,063	45,025
SCOTLAND—			
Factories employed in spinning.....	102	228,119	.....
Factories employed in weaving.....	40	.....	7,826
Factories employed in spinning and weaving.....	105	378,444	4,432
Factories not included in either of the above descriptions.....	10	.....	.....
Total.....	257	606,663	11,758
IRELAND—			
Factories employed in spinning.....	35	10,780	.....
Factories employed in weaving.....	.....	.....	.....
Factories employed in spinning and weaving.....	25	30,076	307
Factories not included in either of the above descriptions.....	..	.....	.....
Total.....	60	40,856	307
Grand total of woolen factories.....	1,800	3,459,482	57,090

NUMBER OF OPERATIVES EMPLOYED.

	England and Wales.	Scotland.	Ireland.	Total.
Males—under 13.....	4,391	579	7	4,977
" 13 to 18.....	10,736	2,770	194	13,699
" above 18.....	39,002	8,467	581	48,050
Total.....	54,119	11,816	782	66,717
Females—under 13.....	2,841	446	2	3,289
" above 13.....	48,411	15,466	722	64,599
Total.....	51,252	15,912	724	67,888
Total—Males and Females.....	105,371	27,728	1,506	134,605

This does not give a full idea of the vast number of persons to whom this great industry gives employment, but only those engaged in spinning and weaving. A very large number are occupied in sorting and stapling, and other operations before the wool goes to the mills and factories, and also in dyeing and scouring it, either as wool or as woollen yarn and cloth; and in many districts much work is done by hand-loom workers in their cottages. None of these come under the operations of the factory act, and are consequently omitted in the returns.

The imports of woollen and worsted yarns (not distinguished in the returns) were in 1861, 1,577,000 lbs.; in 1877, 14,109,586 lbs. The exports of woollen and worsted goods in 1872 and 1877 were as follows: Woollen and worsted yarns, 39,734,924 lbs. in 1872, and 26,972,536 in 1877; woollen and worsted cloths, etc., 385,703,913 yards in 1872, and 238,902,940 in 1877; flannels, blankets, carpets, etc., 26,830,023 yards in 1872, and 23,538,896 in 1877. The total value was £37,028,628 in 1872, and £20,952,659 in 1877. The progress of the woollen manufacture has been less rapid and extensive than that of other textile fabrics, which is believed to be owing to its processes being more numerous and complex, to the greater variety of machines and of work-people required, and to the high price of the raw material.

Worsted Manufacture.—Worsted yarn, as has been already said, is spun in a different way from woollen yarn. In the former the fibers are arranged as parallel as possible; in the latter they are crossed in every direction so as to assist the felting or milling of the cloth. For worsted the wool is first combed, and this was formerly done by hand-combs, a process which has only recently been entirely given up. The introduction of machines for combing wool has formed quite an epoch in the worsted trade. They are of two kinds—those used for combing long, and those used for combing short wool. Heilmann's machine, made in 1846, was the first which did its work successfully. Lister's machine, now much used for combing long-stapled wool, is an improvement upon Heilmann's. It is shown stripped of some of its details in the annexed cut. At G there is a series of gill-combs, which, by means of a screw on the upper gill-shaft S, travels from left to right, and as each gill-comb reaches the jaws J, J, it drops to the lower shaft S', which has also a screw. On this the gill-combs travel in the opposite direction, each being in turn raised to the upper gill-shaft by a cam. These gill-combs, which are heated by gas, are thus traveling in a circuit so to speak. The arrangement of toothed gearing by which the movements of the machine are regulated, we shall pass over, and trace the course of the wool. It is fed to the grooved rollers R, R, from which it passes to the gill-combs at G. As each gill travels forward to the jaws J, J, these close, detach from it a "handful" of wool, and move forward on their frame F to the position shown by the dotted lines. At the same instant the carrier-comb N' takes up the position shown also by dotted lines, lifts from the now opened jaws the "handful" of wool, and carries it forward to the large circular comb C, into the teeth of which it is pressed by the brush B. The comb C moves slowly round to the right till leather bands and rollers at Z, Z, remove the combed wool or "top" in a continuous sliver. Another arrangement strips the comb of the "noil" or short wool.

The remaining processes in worsted spinning closely resemble those for cotton, and are sufficiently described under SPINNING: the products of these are: 1. Fleece (Lincoln wool). 2. Combed "top." 3. Noils, or short wool. 4. Sliver from first drawing-frame. 5, 6, 7, 8, 9, and 10. Slubbings from second, third, fourth, fifth, sixth, and seventh drawing-frames. 11. Roving from roving-frame. 12. Spun yarn.

Figured worsted yarns are woven by various kinds of looms (see JACQUARD LOOM and Loom); plain kinds are woven in looms like those for woollens. Unlike woollens, when worsted goods leave the loom they require only a superficial dressing.

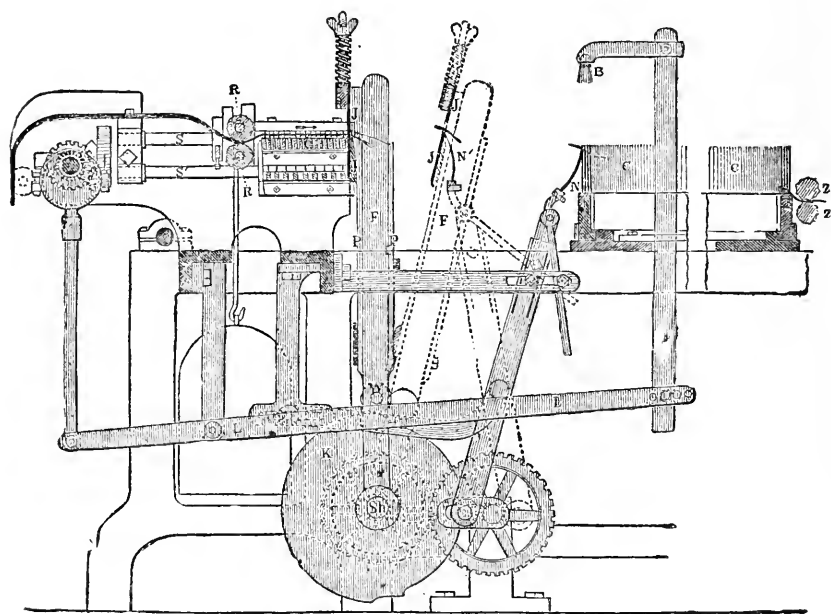
Worsted stuffs are usually classified according to the materials of which they are composed, viz.: 1. Fabrics composed entirely of wool. 2. Fabrics composed of wool and cotton. 3. Fabrics composed of wool and silk. 4. Fabrics composed of wool, silk, and cotton. 5. Fabrics composed of alpaca and mohair mixed with cotton or silk. The first of these classes includes the fabrics so well known under the name of "merinos," and so called because they were first made of Spanish wool; for the "double-twilled"

kinds, the French still maintain their superiority; but for the "single-twilled," the Yorkshire makers are considered the best. This class also comprises shalloons, says, serges, lastings—all stout and heavy fabrics—besides durants, buntings, moreens, damasks, reps, Russells, camlets, and many others, both for dress and furniture. Mouseline de laine was, as its name implies, originally all wool, but it is now more generally mixed with cotton, and printed.

The *second* class includes two fabrics, of which the consumption for female dresses has been immense—viz., Coburg and Orleans cloths, the former being twilled and the latter plain. Many of the names used in the all-wool class are retained in this, with the addition of the word "union," as union merino, union shalloon, union damask, etc. Wineys, now so popular for ladies' winter dresses, on account of their warmth, are made of wool and cotton, from yarns of a heavier and coarser kind than those used for cloths like Coburgs. Wineys are largely made at Aberdeen, Perth, Glasgow, and other places in Scotland, as well as in Yorkshire.

The *third* class includes the rich poplins (q.v.) and tabinets (q.v.), made chiefly in Dublin, and giving employment there to about 1200 hands. Paramatta or Henrietta cloth, Canton cloth, and others, are made both of silk and wool, and cotton and wool. Some Coburgs, Orleans, Russells, and damasks are likewise made with silk warps.

The *fourth* class—viz., mixed goods, in which silk, wool, cotton, and sometimes linen



Wool-combing Machine.

are used—includes peculiar kinds of some of the fabrics named above, and also vestings, linings, cravats, shawls, scarfs, quiltings, boot and shoe cloths, barèges, etc.

The *fifth* class includes alpaca lusters and mixtures—plain, twilled, and figured; alpaca poplins, umbrella and parasol cloth; mohair lusters, glacés, Verona serges, barèges, etc.

The term "worsted" is said to have derived its origin from a village of that name in Norfolk, where this manufacture was first carried on. Up to the end of last century worsted goods were a staple trade of Norwich; but the neglect of the factory system there led to its being transferred to Bradford, which has become renowned as the metropolis of the worsted manufacture. It is also extensively carried on at Halifax and other places in Yorkshire.

The statistics of the worsted manufacture, on the following page, are gathered from the government inspectors' reports for 1875, and refer to that year:

The same remarks apply here as in the case of the return of persons employed in the woolen manufactories, given under that head, and with still greater force, for there are a very great number of small trades connected with the worsted manufacture. The imports of both worsted and woolen yarns have greatly increased of late years, and is no doubt greatly owing to the ingenuity of the Belgians in spinning good yarns from cheap wools, Belgium being the country from which by far the greater portion comes. In 1877, woolen and worsted cloths to the value of about £5,236,000 were imported.

NUMBER AND EFFECTIVENESS OF WORSTED FACTORIES.

DIVISIONS.	Number of Factories.	Number of Spindles.	Number of Power-looms.
England and Wales—			
Yorkshire.....	523	1,381,086	65,789
Other counties.....	138	147,804	9,802
Total.....	661	1,528,890	75,591
Scotland.....	41	* 59,330	6,136
Ireland.....	1	572	.....
Total—United Kingdom.....	692	1,588,792	81,727

NUMBER OF OPERATIVES EMPLOYED.

	England and Wales.	Scotland.	Ireland.	United Kingdom.
Males—under 13.....	14,071	95	.....	14,166
" 13 to 18.....	10,694	564	1	11,259
" above 18.....	20,227	2,393	2	22,622
Total.....	34,992	2,952	3	37,947
Females—under 13.....	15,394	205	.....	15,600
" above 13.....	62,141	6,938	9	69,088
Total.....	77,535	7,143	9	84,687
Total.....	112,527	10,095	12	122,634

With respect to the exports, the following will show the increase which has taken place from 1860 to 1874: 1860—worsted yarn, 25,455,000 lbs. (£3,578,000); worsted stuffs, 148,685 yards (£7,013,000). 1865—worsted yarn, 30,221,000 lbs. (£5,074,000); worsted stuffs, 233,078,000 yards (£13,361,000). 1874—worsted yarn, 34,263,916 lbs. (£5,472,612); worsted stuffs, 261,135,081 yards (£11,888,072). In 1877, the exports had seriously declined—worsted yarn, 26,972,536 lbs. (£3,609,456); worsted stuffs, 194,777,034 yards (£7,725,414).

The rapid increase of the worsted manufacture as compared with the woolen, is no doubt to be ascribed to the greater simplicity of the processes, to the recent introduction of combing-machines, but most of all to the introduction of cotton-warps in 1835, which not only cheapened the goods, but vastly increased their variety.

Information regarding such special branches of the woolen and worsted industries as carpets, shawls, hosiery, tartans, bonnets, etc., will be found under their separate heads. We may state here that the Scotch bonnet trade, carried on at Kilmarnock and Stewarton, employs from 2,000 to 3,000 hands, and sends out about 500,000 bonnets annually.

WOOLLETT, WILLIAM, one of the most eminent of English engravers, was b. in the year 1735 at Maidstone. He went early to London; studied his art under a practitioner of the name of Tinney, now only remembered as having taught him little or nothing; taught himself, however, a good deal, notwithstanding the aid of Tinney, and developing a manner of his own, soon became known as one of the most accomplished engravers of his time. In recognition of his merit, he was ere long appointed engraver to George III. As to his life, except as he is proved to have existed by his works, familiar at this day to every one, nothing is known. He died in London, in the year 1785, after a life of continuous and conscientious labor, as reward of which, a monument was erected to him in Westminster abbey. His works, more especially in landscape, continue to be much prized by connoisseurs.

WOOLMAN, JOHN, 1720-73; b. in w. N. J.; worked on a farm till the age of 21; became clerk in a store at Mount Holly; opened a school there for poor children; became a tailor; desiring to visit the Friends (to which denomination he belonged) in the back settlements of Virginia, went on a tour with Isaac Andrews, 1746; visited the societies of Friends in different parts of the colonies, supporting himself by work at his trade; spoke and wrote frequently on slavery; visited the Indians on the Susquehanna, 1763; went to England for health, 1772. He was a faithful, self-denying Christian worker. He published: *Some Considerations on the Keeping of Negroes; Considerations on Pure Wisdom and Human Policy, on Labor, on Schools, and on the Right Use of the Lord's Outward Gifts; Considerations on the True Harmony of Mind; The Journal of the Life and Travels of John Woolman in the Service of the Gospel.*

WOOLNER, THOMAS, b. England, 1825; studied sculpture with William Behnes. His "Eleanor sucking the Poison from Prince Edward's Wound," and his life-size group of "The Death of Boadicea," were exhibited in 1843. In the next five years he produced "Puck," "Titania with her Indian Boy," "Eros and Euphrosyne," and "The Rainbow." In 1850, in association with William Holman Hunt and D. G. Rossetti, he started a periodical called *The Germ*, representing the ideas of the so-called "Pre-Raphaelites," but it was soon abandoned. Woolner's contributions were principally poems, which were reprinted in 1863 under the title of *The Beautiful Lady*. Among his productions are statues of William III., Prince Albert, Macaulay, and Palmerston; busts of Carlyle, Newman, and Darwin, and the groups called "Ophelia" and "Guinevere." He was appointed professor of sculpture in the Royal academy.

WOOLSACK, the name given to the seat of the lord chancellor of England in the house of lords, which is composed of a large square bag of wool without either back or arms, and covered with red cloth. The woolsack was first introduced in the house of lords as the chancellor's seat in the time of Elizabeth, as a memento of an act which was passed against the exportation of wool, that commodity being then the main source of the national wealth of England.

WOOLSEY, MELANCTHON BROOKS, 1818-74; b. New York; entered the navy in 1832, and was made lieutenant in 1847. In command of the steamer *Ellen* in the s. Atlantic squadron, he fought at Woppey creek and Secessionville creek in 1862, and in the assault on the James Island batteries. In 1863 he helped defend Donaldsonville and fort Butler, being then on the *Princess Royal*. He became commodore in 1871.

WOOLSEY, THEODORE DWIGHT, D.D., LL.D., b. N. Y., 1801; graduated at Yale, 1820, and then studied at the Princeton theological seminary. In 1823-25 he was a tutor in Yale college; 1827-30 he studied at the German universities, and on his return was made professor of the Greek language at Yale. Fifteen years later he was made president of the college, and held that office until 1871, when he resigned on account of increasing old age, but continued for some years to give instruction in international law, and still occasionally preaches at the college chapel. As the head of the college Dr. Woolsey was most successful, not only from his learning, but also from his executive ability. As a publicist his reputation is international. The most important of his writings are his editions of the *Æsthes* of Euripides, the *Antigone* and *Electra* of Sophocles, the *Prometheus* of Æschylus, and the *Gorgias* of Plato; *An Introduction to the Study of International Law* (1860)—his most important work and a standard authority; *An Essay on Divorce and Divorce Legislation* (1869); *The Religion of the Present and of the Future* (a collection of sermons); *Communism and Socialism*, and *Political Science*. Pres. Woolsey also edited and added notes to Lieber's *Civil Liberty and Political Ethics*. He was the chairman of the American branch of the committee having charge of the revision of the New Testament issued in May, 1881.

WOOLSTON, THOMAS, a heterodox divine of the English church, equally remarkable for ingenuity and learning, and for the singularity of his opinions, was born at Northampton in 1669. He was educated at Sidney Sussex college, Cambridge; was elected a fellow of his college; entered into holy orders, and in due course proceeded to the degree of bachelor of divinity. Gifted with a lively fancy, he became a diligent and appreciative student of the works of Origen, and by them seems to have been first imbued with a taste for the allegorical interpretation of the Scriptures. That he was disposed to carry this principle of interpretation much too far for his contemporaries, appeared at once from his first work, published in 1705. This was, *The Old Apology for the Truth of the Christian Religion against the Jews and Gentiles revived*. In this work, Woolston maintained that Moses was only an allegorical person, and all his history typical of that of Christ; that the miracles of the Pentateuch were allegorical, and the miracles attributed to Christ and the apostles pure allegory too; and he stigmatized as atheists and apostates all who received the Scripture narratives as literally, historically true. In subsequent publications he went further in the same direction; also maintaining that the Quakers approached more nearly in doctrine and organization to the primitive church than any other religious body; and denouncing clergymen, because they made a profession of the pastorate, as "hireling priests," worshipers of the beast, and ministers of Antichrist. In 1721 he published *The Moderator between the Infidel and the Apostate*, dialogues tending to show that the gospel miracles, by themselves, could not prove Christ to be the Messiah. This work occasioned great scandal: it abounded in expressions considered indecent and blasphemous; and it was only through the intervention of Whiston, who was friendly to him, and in favor of toleration in matters of opinion, that the author escaped a prosecution. Up to 1720 Woolston had continued to live in his college, leading a studious and blameless life, and showing great kindness to the poor. In 1720 he went to live in London; and in 1721 his college, upon some pretext—really on account of the scandal made by his writings—deprived him of his fellowship. The views set forth in the last-mentioned work, Woolston developed more fully in a series of six discourses during the years 1727, 1728, 1729, republished under the title *Discourses on the Miracles of Christ*. He maintained—representing himself, as in all his works, as the defender of true Christian doctrine—that Christ's miracles, in themselves, were open to the gravest doubts; that, in fact, the gospel narratives, if they were to be

taken literally, were only a tissue of absurdities; and that the authority of the ancient church was against the literal, and in favor of an allegorical acception of them. These views were supported with a good deal of warmth, and mixed up with them were fierce denunciations of the order of clergy. The freethinkers, both in England and on the continent, were now triumphantly quoting Woolston in their favor; and people who had previously been disposed to treat him as a maniac, whose rhapsodies were too wild to call for refutation, began to think it time to rescue the Christian faith from so dangerous and dubious a defender. No less than sixty answers were made to the *Discourses*. Now, too—Whiston no longer intervening—an indictment, at the instance of the attorney-general, was brought against Woolston, on account of the blasphemous and irreligious character attributed to his works. He was tried before chief-justice Raymond at Guildhall, found guilty, and sentenced to be imprisoned for a year, and to pay a fine of £100, and ordered to find securities to the amount of £2,000 that he would not repeat his offense. He was imprisoned in the Queen's bench prison; and being unable to pay the fine, and both unable and unwilling to provide the requisite securities, the remainder of his life was spent within the rules of the prison. It was not long protracted. He died on Jan. 27, 1731. His death-bed scene has often been described as if it supported the supposition that Woolston was insane, but surely without good reason. It is stated that as he felt death approaching he closed his eyes with his own fingers, saying to the turnkey who attended him, that he desired to die decently; and his last words were: "This is a struggle which all men must go through, and which I bear not only patiently but willingly." His body was interred in the church-yard of St. George's, Southwark.

WOOLWICH, a market, and parish of Kent, the seat of the chief government arsenal of Great Britain, stands on the s. bank of the Thames, about nine m. e. of London. It stretches along the bank of the river for two m., and reaches back from the river for half a mile, as far as the brow of the hill, where are the royal artillery barracks and hospital. The general appearance of the town has little to recommend it; but the southern suburbs are handsome and regular. There are numerous places of worship—Established, Roman Catholic, and dissenting, and there are numerous schools, a theater, etc. Its dock-yard, its government manufacturing establishments for the production of material of war of every description (except gunpowder), and the fact that it is a great depot for naval and military stores, and also the headquarters of the great corps of royal artillery, combine to render Woolwich a place of great importance. A royal dockyard existed here as early as 1515, and the *Henry Grace de Dieu*, which conveyed Henry VIII. to the field of the cloth of gold, is said to have been built here, though this statement has been disputed. The *Royal George* (q.v.) was built here in 1751. The royal dock-yard and ship-building establishment was, however, closed on Oct. 1, 1869. The yard comprised large dry-docks, and a basin 400 feet long by 300 feet wide, and was furnished in every respect with the newest and most efficient apparatus. The royal arsenal, the largest in Britain, contains not only the largest stores of all kinds—shot, shells, cannon, etc.—which are required for our armies, navies, and forts, but it comprises also establishments for manufacturing them, and for constructing gun-carriages, and preparing ammunition for cannon and small-arms. These works are carried on in the three departments called respectively the gun factories, carriage department, and laboratory. On the common, south of the town, is the royal military academy, for the education of cadets destined for the artillery and engineers. See MILITARY ACADEMY, ROYAL; and GUN FACTORIES, ROYAL. Pop. '71, 35,557.

WOONSOCKET, a township of Rhode Island, on the Blackstone river, 16 m. n. by w. of Providence, containing a central and several smaller villages, numerous cotton-mills, woolen mills, machine-shops, iron-foundries, sash, blind, and planing mills, factories of thread, silk, gold pencil cases, jewelry, musical instruments, etc.

WOORALI POISON. Since the original publication of the article CURARI, which is one of the synonyms of this substance, the physiological actions of this fearful poison has been carefully studied by Drs. Weir, Mitchell, and Hammond, of the United States; and the essay in which their joint labors are recorded is published in Hammond's *Physiological Memoirs* (1863). This essay is so valuable, and contains so much original matter regarding two other allied poisons whose native names are *cororal* and *uro*, that we shall give a brief abstract of its contents: premising that, for the best account of the history of this remarkable poison, the reader should consult Bernard's *Légons sur les Effets des Substances Toxicques* (1857, p. 238). We shall notice the physical and chemical properties of this poison before describing its physiological action. The best of the earlier investigations of the poison is that of Roulin and Boussingault in 1828, who obtained from the crude "woorala" an alcoholic extract, to which they gave the name of *curarin*. This curarin was a solid transparent mass, of an excessively bitter taste, and possessed in an eminent degree of all the virulence of the woorali. Heintz has subsequently examined the precipitate which tannic acid throws down from the watery solution of the poison, but only found that it contained no nitrogen, and was composed of apparently inert substances, as sugar, gum, resin, extractive matter, tannic and gallic acids, etc. He sought in vain for strychnine in it. Among the chief experimenters on the subject may be mentioned De la Condamine (*Mém. de l'Académie des Sciences*, 1745, t. 62, p. 391); Brocklesby (*Philosophical Transactions*, 1747, vol. xlv, p. 408); Herissant (*Philosophical Trans-*

actions, 1751-52, vol. xlvii, p. 75), who killed a bear with a poisoned arrow in less than five minutes; and nearly killed himself and a small boy who was evaporating an aqueous solution of the poison; both, however, recovered under the influence of fresh air, a pint of wine, and a quantity of sugar; Fontana (1781), who showed that (notwithstanding the above experiment) the vapor is not deleterious, and that the state of the stomach at the time when the poison was inhaled modified the result, an animal with a full stomach being able to resist the action of a dose that would prove fatal to one of the same size when fasting; Brodie (*Philosophical Transactions*, 1811-12); Virchow and Münter (published in vol. i. of Schomburgk's *Reisen in Britisch Guiana*), who, *inter alia*, showed that the poison, even after being kept dry for five years, is still intensely active—that its physiological action corresponds with the result of analysis in showing the absence of strychnine, and that it rather belongs to narcotic than to tetanic poisons—and that death takes place not from any direct result of the poison, but indirectly, by causing the cessation of the respiratory process; Bernard and Pelouze (*Compt. Rend.*, 1850, t. xxxi, p. 534); Vulpian (*Compt. Rend.*, 1854, t. i., 2d series, p. 73); and Kölliker (*Proceedings of the Royal Society*, 1857), who, among other important conclusions, arrives at the following: (1) That the *urari* (as he terms it) causes death very rapidly when injected into the blood or inserted into a wound; and that when introduced by way of the mucous membrane, its effects are slow, and require a large dose for their production; when applied to the skin of frogs, it is inoperative; (2) it acts through the blood, and destroys the excitability of the motor nerves, while the sensory nerves are hardly at all affected; (3) when artificial respiration is carried on in animals under its influence, many of the secretions are increased, owing to the paralysis of the vascular nerves, and the consequent dilatation of the vessels; (4) that in mammals, the poison causes death by the paralysis of the respiratory nerves and suppression of the respiration, which brings on convulsions as a collateral effect.

The late researches of Weir, Mitchell, and Hammond, on the two hitherto undescribed varieties of the poison, named *woorara*, variety *corroval*, and *woorara*, variety *vao*, lead to the following results: The corroval, which is asserted to be the strongest arrow-poison, but of whose mode of manufacture they could learn nothing, was in large lumps of a brownish-black color, resembling vegetable extracts of that tint. From its aqueous solution they obtained a substance possessing all the qualities of an alkaloid, and in an eminent degree the poisonous properties of the corroval, to which they assign the name *corrovalia*. Hence it differs materially in its chemical composition from ordinary woorali. From a large number of experiments on living birds, mice, cats, frogs, and alligators, they find (1) that corroval differs essentially from any variety of woorali hitherto described in its physiological results; (2) that it acts primarily on the heart through the medium of the blood, producing an arrest of the heart's action; (3) that the annihilation of voluntary and reflex movements is a secondary result of its action, depending primarily on the cessation of the heart's action; (4) that it acts upon the nerves from the surface to the center, and abolishes both the sensory and motor functions; (5) that it destroys muscular irritability; (6) that it paralyzes the sympathetic nerve, this being one of its primary effects; (7) that it is absorbed both from the intestinal canal and skin of frogs; and (8) that its poisonous effects are due to an alkaloid hitherto undescribed. The authors devote 42 pages to a history of their experiments on *vao* or *baa*; but as they are of opinion that *vao* is only a weaker variety of corroval, it is unnecessary to follow their researches in this direction. It is obvious that in corroval and *vao* we have a fearful poison, quite distinct from ordinary woorali; and we have entered into further detail on this subject than we should otherwise have done, because, so far as we know, they have not yet been noticed by any English author.

WOOSTER, a city and co. seat of Wayne co., Ohio; a station on the Pittsburg, Fort Wayne, and Chicago railroad; pop. '80, of city, 5,843; of township, 7,060. The city is situated in the center of a prosperous agricultural region, with which it does a large trade. It is the seat of the Wooster university (Presbyterian), having about 300 students in all departments. There are manufactures of flour, furniture, organs, whips, engines, and agricultural implements. There are 2 banks, 2 weekly papers, a court-house, high-school, and 13 churches.

WOOSTER, DAVID, 1710-77; b. Conn.; graduated at Yale college, 1738. Soon after the beginning of the war between Great Britain and Spain he commanded a vessel for coast defense, and was capt. of a sloop-of-war at the siege of Louisburg, in 1745. Ten years later he was col. of the 3d Conn. regiment. He was a brig.gen. through the campaign in the n., 1758-60, and was one of the first to propose the Arnold expedition against Ticonderoga early in 1775, and in the same year was made brig.gen. in the continental army. He succeeded Montgomery in Canada, and was mortally wounded defending Danbury, Conn., against Tryon.

WOOTZ is a finely damasked hard cast-steel, which is obtained from India. Faraday found aluminium in a sample which he analyzed, and referred its peculiar properties to the presence of this metal; but other chemists have failed in finding aluminium in wootz.

WORCESTER, a co. in s.e. Maryland, bounded on the w. by the Pocomoke river, adjoining Delaware and the Atlantic ocean; about 450 sq.m.; pop. '80, 19,539—1948 of American birth, 6,984 colored. Co. seat, Snow Hill.

WORCESTER, a co. in central Massachusetts, bounded on the n. by N. H., on the s. by R. I. and Conn.; 1500 sq. m.; pop. '80, 226,885—173,135 of American birth. Co. seats, Worcester and Fitchburg.

WORCESTER, a city of Massachusetts, the center of a fine agricultural district, 45 m. w.s.w. of Boston, with several diverging railways, in a valley surrounded by beautiful hills, with delightful sites for residences, broad, shaded streets, and famed for its political and philanthropic conventions. Among its institutions are the American antiquarian society, with a library of 50,000 volumes, and cabinet; the state lunatic asylum, which, in 13 years, out of 2,306 patients, discharged 1000 cured; Oread institute for young ladies; high, grammar, intermediate, and primary schools, considered the model schools of New England; also, manufactories of cotton, woolen, carpets, hollow-ware, pistols, wire, paper, saddles, locks, musical instruments, etc. There are 30 churches, 12 periodicals, 3 daily. Pop. '75, 49,265.

WORCESTER (*ante*), the semi-capital of Worcester co., on the Boston and Albany, the Norwich and Worcester, the Worcester and Nashua, the Providence and Worcester, and the Boston, Barre, and Gardner railroads; pop. '80, 58,295. It has gas-works, water-works, a street-railroad, and a good drainage system. There are some 35 churches, 7 banks, 5 insurance companies, a clearing-house, and 7 newspapers, of which 2 are daily and 1 tri-weekly; 3 are French. The chief public buildings are the co. court-house, the Union depot, the high-school building, and the state normal school. The new state lunatic hospital is about 1 mile out of the city. The old hospital is now used for the incurably insane only. Among the public institutions of the city are the city hospital, the orphans' home, the home for old men, and the home for aged women. Among the educational institutions are a state normal school, the college of the Holy Cross, which is the chief Roman Catholic college in New England, and has fine grounds and buildings, the Highland military academy, the Worcester co. free institute of industrial science, a well-endowed school of technology, and the Worcester academy, a fitting-school under Baptist management. The most important manufacture is that of boots and shoes, of which there are nearly 30 factories. Next come iron and wire. Machinery, boilers, woolens, corsets, etc., are largely manufactured. Worcester was incorporated as a town in 1722, as a city in 1848. The declaration of independence was first read in Massachusetts from the steps of the Old South church, still standing on the common.

WORCESTER, a city, capital, and assize-t. of the county of the same name, and a county of itself, stands almost in the center of the Severn valley, and is situated principally on the eastern bank of the river, about 26 m. s.w. from Birmingham. Worcester is of great antiquity; there are abundant traces of ancient iron-smelting works on the banks of the river, adjudged by antiquaries to belong to the times of the Roman occupation; and the frequent discovery of other remains proves that the city was a Roman station. The chief object of antiquity now existing is the cathedral, which is beautifully placed on a gentle elevation on the e. bank of the river, and stands within its own precinct, but which, since the passing of the act abolishing the isolation of "peculiarities" and "non-parochial places," has been incorporated in the city parish of St. Michael. A cathedral, dedicated to St. Peter, was founded here as early as the 7th c. In 1084 bishop Wulstan laid the foundation of a new cathedral, many portions of which remain in the present structure, such as the crypt (one of the oldest and most interesting in England), the bases of, and fragments in, many of the walls, chapter-house, refectory, and cloisters. In the civil wars much damage was done to the building, but none of its leading features were destroyed. It is now distinguished by the simplicity, if not plainness, of the exterior, but which is amply compensated by the fine perspective, the lofty roof, and generally charming effect of the interior. A thorough restoration was commenced in 1855 under the late sir G. G. Scott, and completed at a cost of about £100,000. The tombs of king John and of Arthur, prince of Wales (eldest son of Henry VII.), are the chief ancient monuments in the building. The episcopal palace in the city has been transformed into the deanery; and the bishop of Worcester, since the ecclesiastical commissioners assumed the management of the episcopal and capitular estates, has his residence at Hartlebury castle. The bishop of Worcester's revenue has been fixed by the ecclesiastical commissioners at £5,000; and the livings in his gift are numerous and of considerable value. Worcester chapter consists of the dean, 4 canons, 24 honorary canons, and 4 minor canons, including the precentor. Besides 10 chorister boys, there are 40 other boys on the foundation at the college or cathedral school, who receive gratuitous education, and about 60 non-foundation boys. There is also a city grammar school, founded by queen Elizabeth, and largely attended. The parish churches of the city, 11 in number, are poor specimens of architecture. The city does not shine in public buildings. Next to the cathedral, the most important are the shire-hall, the guild-hall, and the county prison; but there are also the city library, the Worcester museum, a corn-exchange, and music-hall. The battle of Worcester, fought in 1651, is memorable in history, and Charles II., to commemorate the fidelity of the citizens to his cause, granted the motto to the city arms: "Civitas in bello et in pace fidelis." Pop. of the city, '71, 38,113. The people are employed in glove-making, including leather-dressing and staining; in porcelain factories, iron-works, including locomotive-engine factories, tanning and currying, horse-hair weaving, vinegar, British wine and sauce-making,

and coach-building. Chemical manures and agricultural implements are also manufactured on a considerable scale. Glove-making is still considered the staple manufacture of the city; but one large factory has absorbed a large portion of the business, and now there are not above two dozen of master-glovers, great and little, whereas 40 years ago there were nearly 100 in the trade. There are 2 porcelain factories, and the number of hands employed by them in all departments is about 500. The Royal porcelain works are celebrated for fine taste in designing and the beauty of execution of the highest class of productions; while the speciality of the other factory, Messrs. Grainger & Co.'s, utility, combined with purity of design and excellence in workmanship. The glazed semi-porcelain is also famous. Hops are grown in the neighborhood: there is a trade in malt, corn, and coals. There are a daily and 4 weekly newspapers, one of the latter the oldest provincial paper in England (founded 1690). The city is on the Midland and Great Western railways. Worcester sends 2 members to parliament, and is governed by a corporation consisting of a mayor, 12 aldermen, and 36 councillors. It has also a recorder and sheriff.

WORCESTER, EDWARD SOMERSET, Marquis of, 1601-67; b. England; his father being the first marquis of the name. He was a royalist in the revolution, and for a long time defended Raglan castle against the Puritans. He was the first to invent and make an engine worked by the power of steam. This was described in *An Exact and True Definition of the most Stupendous Water-Commanding Engine, invented by the Right Honorable (and discreetly to be praised and admired) Edward Somerset, Lord Marquis of Worcester*, and may also be found described in a life of Worcester published by Dirck in 1865.

WORCESTER, JOSEPH EMERSON, LL.D., 1784-1865; b. N. H.; graduated at Yale college in 1811. While teaching school at Salem, Mass., he was engaged upon his *Geographical Dictionary*, or *Universal Gazetteer*, which appeared in 2 vols. 1817, and was followed the next year by *The Gazetteer of the United States*. In 1819 he took up his residence at Cambridge, Mass., where the rest of his life was spent, with the exception of a visit to Europe in 1830, which he employed in making researches and collecting materials for his studies in lexicography and philology. He edited the *American Almanac*, 1831-43; published an edition of Johnson's *Dictionary* in 1827; made an abridgment of Webster's *American Dictionary* in 1828, and published a *Comprehensive Pronouncing and Explanatory Dictionary* in 1830. His *Universal and Critical Dictionary of the English Language* appeared in 1846. His quarto *Dictionary of the English Language* was published in 1860. An edition, with additions, was published in 1881. Among his other works are an *Epitome of Geography* (1820), and *Pronouncing Spelling-Book* (1857).

WORCESTER, NOAH, D.D., 1758-1837; b. N. H.; served three campaigns in the revolutionary war, being a fifer at Bunker's hill and a soldier at Bennington; resided at Thornton, N. H., and was sent to the legislature; published in 1787 a *Letter to the Rev. John Murray on the Origin of Evil*; pastor of the church in Thornton; employed by New Hampshire missionary society, 1802. He published, 1810, *Bible News, or Sacred Truths Relating to the Living God, His only Son, and Holy Spirit*, which was condemned as heretical by the Hupkinton association; edited *Christian Disciple*, Boston, 1813-18; published, 1814, *A Solemn Reciter of the Custom of War, by Philo Pacificus*; was one of the founders of the Massachusetts peace society, and its secretary, 1816; edited *Friend of Peace*, 1819-29. His other works are: *The Atoning Sacrifice a Display of Love, not of Wrath*; *Causes and Evils of Contentions among Christians*; *Last Thoughts on Important Subjects*.

WORCESTER, SAMUEL, D.D., 1770-1821; b. N. H.; brother of Noah Worcester; graduated, Dartmouth college, 1792; pastor Congregational church, Fitchburg, Mass., 1797-1802; of Tabernacle church, Salem, Mass., 1803 till his death. He was elected corresponding secretary of the American board of missions, 1810. He was prominent in the Unitarian conflict. He published *Six Sermons on the Doctrine of Eternal Judgment*; *Discourses on the Covenant with Abraham*; *Three Letters to Dr. Channing on Unitarianism*; *Watts's Entire and Select Hymns*. A posthumous volume of sermons was published.

WORCESTER COLLEGE, OXFORD, was founded, like Trinity and St. John's, on the site of an old monastic college. The ancient institution was known by the name of Gloucester college, because it belonged to the Benedictine monks of that city. After the dissolution of the monasteries, it passed through various hands; and latterly was a hall attached to St. John's college. In 1701, however, sir Thomas Cookes left £10,000 for the purpose of endowing some existing college or hall. This bequest led to the erection of Gloucester hall into a college, for a provost, six fellows, and six scholars, by letters-patent of queen Anne, 1714. Various fellowships and scholarships were afterward added, until the number of fellows became 21, of scholars 16, but almost all restricted to certain counties, or to founders' kin. The commissioners under 17 and 18 Vict. c. 81 reduced the number of fellowships to 15, open without restriction, except that candidates for a fellowship on the Eaton foundation must be sons of clergymen of the church of England and Ireland, and must not be possessed of property or income exceeding £150 a year. The scholarships are now 16 in number—six on the foundation of sir Thomas Cookes, for persons educated at Bromsgrove school; one on the founda-

tion of Dr. Finney, for natives of Staffordshire; five on the foundation of Mrs. Sarah Eaton, for sons of clergymen of the church of England; and three on the foundation of Dr. Clarke, and one on the foundation of Robert Barnes, esq., which are entirely open. Most of the scholarships are of the value of £75, tenable for five years. There are also six exhibitions—four on the foundation of sir Thomas Cookes, value £42 a year, for persons educated at Bromsgrove school. There are ten benefices in the gift of this college.

WORCES'TERSHIRE, one of the west-midland counties of England. The conterminous counties are those of Warwick and Stafford on the n., Warwick and Oxford on the e., Gloucester on the s., and Hereford and Salop on the west. Area, 472,453 acres, whereof about 400,000 are cultivated. Its greatest length is 38 m., and greatest breadth, 26. The surface is undulating, and there are depressed valleys and hilly ranges; two of the latter are of considerable extent, and adorn its eastern and western sides. On the west, the range terminates in the Malvern hills, one of the highest points of which is the Worcestershire beacon, about 1100 feet above the level of the sea. Its name is derived from its shape, a cone towering beacon-like above the lesser eminences of the chain; but the highest peak of the range is named the Herefordshire beacon, which stands within the county of Hereford. The eastern range is the Bredon hills, which form part of a chain extending from Bromsgrove Lickey, near Birmingham, to the Cotswold hills, near Gloucester. The county is well watered, and finely timbered, especially with fruit-trees. The elm grows very luxuriantly, and indeed is so common in every corner as to have obtained the name of "the weed of Worcestershire." The oak, beech, and other timber trees thrive well, and of late the larch has been much planted. The principal rivers are the Severn, the Teme, and the Avon. Other streams there are, such as the Stour, the Salwarp, etc., but except in flood-times, these are mere brooks, and scarcely deserve the name of river. The Severn is navigable for vessels of 80 tons as high as Worcester, and for those of 60 tons to Stourport, 14 m. further; and smaller boats can reach Shrewsbury, the river being navigable for 180 miles. There are three canals communicating with the Severn—viz., the Staffordshire and Worcestershire at Stourport; the Droitwich, a little way above Worcester; and the Birmingham and Worcester, in the immediate neighborhood of the city. The w. portion of the vale of Severn is about 30 m. long; the climate is mild and healthy; but the rainfall is comparatively small, and nearly the minimum of England. There are mineral springs at Malvern, Evesham, Dudley, and Kidderminster. Nearly the whole of the county is on the red sandstone formation, but the Malvern and Lickey hills are of igneous origin. The soil consists of almost every variety suitable for vegetation, from strong deep clay and rich vegetable mold, to light friable sandy ryeland, with tracts of alluvial deposit, marl, and loam. The vale of Evesham is dependent on the Avon for its fertility, which has long gained for it the reputation of being the garden of the mid-west. It produces abundance of table-fruit, and vegetables of the finest quality. The agriculture of Worcestershire has been greatly improved during the last thirty years, and high-farming is now much in vogue. Excellent crops of wheat and other grains, turnips, and potatoes are raised; a large portion of the land remains in the form of meadow, and much of it ancient pasture.

Hop-gardens are beautiful in the western division of the county, and their produce ranks, in the estimation of brewers, next to that of e. Kent. Worcestershire is *par excellence* a perry county, as Herefordshire and Devonshire are cider counties. Its pear orchards are very beautiful in the time of blossom; and there is a splendid variety, called the "black pear of Worcester," which attains a great size, and is supposed to be the traditional pear blazoned on the county's shield of arms.

There is no distinctive local breed of stock, either cattle or sheep. The cattle in most favor are Herefords and shorthorns; and among sheep, the favorite varieties are Shropshire downs, Leicesters, Cotswolds, and cross-breeds. Pigs are abundantly bred and fed. The markets are well supplied with butcher-meat, bred and fed in the county; and London, Birmingham, and the "black country" draw large supplies from Worcestershire. Poultry are raised in considerable quantity, and the Worcestershire farmers' wives have deservedly obtained a good name for the condition and neatness in which they are sent to market. The county possesses great mineral wealth in coal, iron, salt, lime: the first three are found in the north-eastern quarter of Worcestershire, but lime is very generally distributed. Coal and iron mines are largely worked in the neighborhood of the populous borough of Dudley. Iron-works abound between it and Stourbridge, where glass manufactures of an ornamental character, on a large scale, have taken root; and there are abundance of coal-mines in the neighborhood. Quarries of limestone are largely wrought near Evesham and Pershore.

The textile fabric manufactures are nearly confined to carpet-weaving, which has long been carried on successfully at Kidderminster; but the town has almost ceased to produce that description of goods known by its name, "brussels" and "tapestry" being principally manufactured. At and in the neighborhood of Worcester a considerable number of persons are engaged in glove-making. Worcestershire china, which has gained a world-wide reputation, is also produced upon a large scale in the capital city. At Redditch, the needle and fish-book manufacture is carried on to a greater extent

than in any other place in England; nail-making has been practiced for centuries at Broomsgrove; and at Droitwich, about 6 m. from Worcester, salt has been manufactured for many centuries from an inexhaustible supply of brine. Pop. (1871) 338,837, of whom about 200,000 are connected with mines and manufactures, and the remainder are engaged in agriculture, or dependent on trade. Of the above number, upward of 8,000 are engaged in hardware manufactures; a large proportion in nail-making, the rest in the manufacture of iron and steel, glass and porcelain, needles, fish-hooks, tools, fenders, fire-irons, shovels, screws, rivets, swords, cutlery, and steel toys. The county is in the Oxford circuit, and in the district of the Birmingham court of bankruptcy. The county sends four knights of the shire to parliament, and six members for the boroughs of Evesham, Kidderminster, Droitwich, Dudley (one-half of which is in Staffordshire), Bewdley (and Stourport united), besides two for the city—making a total of twelve members from Worcestershire.

WORD, in time of peace, a signal notified in the orders of the day, in virtue of a knowledge of which a sentry will allow the utterer to pass. In the field the officer commanding fixes daily upon a word and countersign (for which any arbitrary terms are taken), and communicates them to the sentries on guard, and to such other persons only as he may choose to permit to pass through the lines. Any person then approaching a sentry without knowing the *word*, has a fair chance of being shot; if he knows not the countersign, the sentry will take him into custody, and deliver him to the officer of the guard. Care has to be taken that the "word" should not suggest the "countersign." Any arbitrary combination is therefore adopted.

WORDE, WYNKIN DE. In returning to England about 1477 to introduce the art of printing, William Caxton (q.v.) brought with him Wynkin de Worde, a native of Lorraine, whose acquaintance he made at Cologne. De Worde superintended Caxton's printing-office till the latter's death, and afterward succeeded him. He made great improvements in the art of printing, and especially in that of type-cutting, which then formed a branch of the profession. He is said to have first introduced Roman letters into England, using them as we now use italics. In some of his books he even introduced a sprinkling of Greek, Hebrew, and Arabic, which were produced in wood-cut. He also made extensive use of engravings, which, however, appear to have been mostly obtained from the continent. The books printed by him are generally distinguished by their neatness and elegance, and far exceed in number those of his predecessor, being 408 distinct works against 99 by Caxton. De Worde died in London about 1534.

WORDEN, JOHN LORIMER, b. N. Y., 1817; entered the navy as midshipman, 1835. In 1861 he was sent to fort Pickens with dispatches, and while returning was made prisoner and detained seven months. In 1862 he was given command of the experimental iron-clad *Monitor*, and on Mar. 9, fought the famous battle with the confederate ram *Merrimack*, in Hampton roads. His eyes were partly blinded by a shell striking the look-out hole of the pilot-box. In 1863, in command of the *Monitor*, he destroyed the privateer *Nashville*, and took part in Dupont's attack on Charleston. From 1869 to 1874 he was at the head of the U. S. naval academy at Annapolis.

WORDSWORTH, CHARLES, D.C.L., b. England, 1806; graduated with honors at Oxford, 1830; tutor at Cambridge, 1830-33, having William E. Gladstone and cardinal Manning among his pupils; second-master of Winchester college, 1835-46; first warden of Trinity college, Scotland, 1846-54, contributing largely to its establishment, and building the chapel at an expense to himself of \$44,000; consecrated bishop of St. Andrews, 1853; has zealously endeavored to obtain "a united church for the United Kingdom;" is author of several theological works and of a popular Greek grammar, and is a member of the New Testament revision committee.

WORDSWORTH, CHRISTOPHER, D.D. 1774-1846; b. Cumberland, Eng.; graduated at Cambridge and became a fellow of Trinity college, of which he was master 1820-41. He published *Ecclesiastical Biography* (1809); *Who Wrote Eikon Basilike?* (1824); *Christian Institutes* (1837); and a volume of sermons.

WORDSWORTH, CHRISTOPHER, D.D., b. England, 1807; son of Dr. Christopher, of Trinity college, Cambridge, and a nephew of the poet. He was educated at Winchester and Cambridge, took orders in the church of England, and was head-master of Harrow school, 1836-44, when he became a canon of Westminster. In 1869 he was consecrated bishop of Lincoln. Among his works are an edition of the Greek Testament; *The Memoirs of William Wordsworth: Greece; and St. Hippolytus and the Church of Rome*.

WORDSWORTH, WILLIAM, a distinguished English poet, was b. April 7, 1770, at Cockermouth, in Cumberland. He was the second son of John Wordsworth, attorney, and agent on the estates of the first earl of Lonsdale. He was sent to school at Penrith, where his parents had gone to reside; and after the death of his mother in 1778, was transferred to Hawkshead, in Lancashire, at the public school of which his earlier education was completed. In 1782 his father died, leaving his family in some difficulty. By lord Lonsdale a considerable sum was due to them; but his lordship, a man of most eccentric character, saw fit to resist the claim with all the vexatious impediments which the law so plentifully affords. Enough, however, remained, with some little assistance from relatives, to carry forward the education of the children. Wordsworth remained

at Hawk-head till 1787, in which year he was entered at St. John's college, Cambridge. Here he remained four years. In the studies proper to the place, his interest was slight; but in his own fashion he was a diligent student; and poetry became more and more his favorite pursuit. In Jan., 1791, he left Cambridge, after taking his degree as bachelor. During the autumn of the previous year, he had, along with a fellow-student, made a pedestrian tour through France, then in the early fervors of its great revolution; and thither, after leaving college, he returned. His sympathy with the aims of the revolution was passionate; and with the party of the Gironde he seemed to have cultivated relations of a somewhat intimate kind, which, in the end, might have seriously compromised him, had not circumstances, probably of the pecuniary sort, determined his return to England some little time before his friends were sent in a body to the scaffold. The republican principles which at this time he held, he lived to renounce in favor of a reasoned conservatism; and opposed as he was, in its earlier stages, to the war waged against France, no one more patriotically urged it, when the struggle became in effect a life and death grapple on the part of England with the military despotism of Napoleon.

In 1793 Wordsworth came before the public as an author, in two poems, entitled *An Evening Walk, addressed to a Young Lady*; and *Descriptive Sketches, taken during a Pedestrian Tour among the Alps*. These pieces abound in touches of refined and original observation of nature, but otherwise are not in themselves specially remarkable; and they failed to make any impression, except on a few minds, such as that of Coleridge, then at Cambridge, who afterward professed to have discerned in them the seeds of a great undeveloped genius. Wordsworth was now in a position of much perplexity; his little finances were almost entirely exhausted; for the church, which his friends would fain have had him enter, he had at this time an obstinate aversion; poetry had become with him a passion, to which he longed to wholly dedicate himself; and unhappily it appeared that *his* poetry would not in the least pay. As a poet cannot live like a singing-bird by pecking about the hedgerows, it became necessary for him to bethink himself of some means of support; and he was on the point of proceeding to London, to do liberal politics for the newspapers, when unexpected relief came to him in the shape of a legacy. The name of Raisley Calvert deserves to be remembered with that of Wordsworth. An intimate friend of the poet, he had formed a high opinion of his genius; and at his early death in 1795 he was found to have bequeathed to Wordsworth the sum of £900, expressly that leisure might for some years be allowed for the undisturbed development of his powers. Seldom has money been better bestowed; and small as the sum may seem, to a man of the poet's simple tastes and entire singleness of aim, it could suffice over a term of years. With his only sister, Dorothy, his attached companion through life, and always a devout believer in the brother, no little of whose genius she shared, he now settled himself at Racedown lodge, in Dorsetshire, removing in 1797 to Alfoxden, in Somersetshire, in order to be near Coleridge, who had established himself some 3 m. off at Nether-Stowey. Out of the intimacy thus begun came the famous *Lyrical Ballads*, published in 1798 by Cottle of Bristol, as a joint adventure of the two poets. The volume had no success; but probably no man ever lived more serenely self-appreciative than Wordsworth; and he did not allow himself to be disheartened by the neglect meantime of the world. After a short tour in Germany, along with his sister and friend, he returned to his native Cumberland, which he never again permanently left. He settled himself first at Grasmere; in 1808 he removed to Allan bank, in the vicinity; and in 1813 he transferred his household to Rydal mount, the place which, of all others, remains specially associated with his memory. On the death of the old lord Lonsdale, the justice of the claim of the Wordsworths against the estates was admitted; and in 1802 a sum of about £8,000 was by his successor made over to the family. To Wordsworth and his sister their moiety of the money may have been acceptable, as by this time, one should say, they must needs have been seeing pretty nigh to the end of Raisley Calvert's convenient £900. Henceforth a modest competence was secure to them; and Wordsworth was wedded within the year to Mary Hutchinson, a cousin of his own, with whom he had been intimate from his childhood. In 1813, by the kindness of lord Lonsdale, he was appointed distributor of stamps for the county of Westmoreland, a situation which brought him, without much to do for it, a salary of £500 a year. When, the year after, he published his great poem, *The Excursion*, he dedicated it to lord Lonsdale, in a sonnet, expressive of "high respect and gratitude sincere" for this comfortable increase to an income sufficient, perhaps, but certainly not excessive, for a man who had now a family growing up round him. Meantime, and pending the appearance of this elaborate work, the reputation of the poet had been surely, if slowly, rising. In 1800 he had published, in two volumes, a second edition of the *Lyrical Ballads*, disjoining his own from those of Coleridge, and adding a quantity of new matter; and in 1802 and 1805 further editions had been issued. To these succeeded, in 1807, a new collection, under the title of *Poems, in Two Volumes*. In these earlier writings there was a good deal which almost wilfully seemed to invite ridicule; and for a good while Wordsworth was merely the laughing-stock of reviewers, more particularly of Jeffrey, who, as editor of the great *Edinburgh*, at this time figured as chief Aristarchus of the day. The more to popularize the ridicule, a nickname was invented; and "the Lake School," as it was called, which, with Wordsworth, included Coleridge and Southey, who chanced to reside in the same district, passed current as an easy name of scorn. It could not be long concealed, how-

ever, that these volumes of Wordsworth, despite an occasional eccentricity in the choice of mean and impracticable subjects, contained a large body of true poetry of a singularly fresh and original kind. A select circle of passionate admirers, including men like Leigh Hunt, De Quincey, and Wilson, eagerly pressed the true claims of the poet; and after the publication of the *Excursion*, a volume of high and serious verse, gravely defective in plan, and at times heavy and tedious, but with little or no trace in it of the earlier oddities of the writer, it came more and more to be felt that the laughers were getting the worst of it, and that Wordsworth, however he might now and then indulge himself in whimsical tricks, was really a man of true and lofty genius, against whom ridicule could not permanently avail. Their occupation was not yet, indeed, quite done; and the subsequent appearance, in 1819, of *Peter Bell*, a poem not without profound merits, but unhappily with a donkey for the hero of it, allowed them to resume their advantage a little. But, on the whole, the day of idle jeer was over: the tide of genuine appreciation had set in, and it continued to flow steadily, till, long before his death, Wordsworth found himself recognized almost *nem. con.* as at the head of the poetical literature of his country. His later days were passed serenely in honor. In 1839 the university of Oxford conferred on him its honorary degree of D.C.L. In 1842 a pension of £300 per annum was assigned him by government; on receipt of which he ceded, in favor of his son, his situation as distributor of stamps; and on the death of his friend Southey, in 1843, he succeeded to the vacant laureateship. On April 23, 1850, he peacefully closed a life so pure, serene, and priest-like in its consecration to a lofty purpose, that we must go back to Milton in order to find its parallel. It remains only to enumerate the publications of Wordsworth not included above. In 1815 appeared *The White Doe of Rylstone*, which was followed by *The Waggoner*, and a series of *Sonnets on the River Duddon*. In 1822 he published a volume entitled *Memorials of a Tour on the Continent*; some years after, his *Ecclesiastical Sonnets*; and in 1835, *Yarrow Revisited, and Other Poems*, the fruit of a tour to Scotland, memorable by his mournful parting, at Abbotsford, with the dying Scott, which he records in a beautiful sonnet. In 1842 he issued a collected edition of his works, rearranged as we now have them, in a somewhat fanciful fashion of his own. Shortly after his death, a long autobiographical poem, in blank verse, was published, entitled *The Prelude*.

By remanding it to truth and simplicity of natural feeling as its basis, Wordsworth did more than perhaps any other writer of his time to forward the great revival of English poetry which distinguished the opening of the century. But he was scarcely the originator of the movement; the new influence was, so to speak, "in the air;" already Cowper in England, as in Scotland Burns, had preluded to the melodious outburst which was to follow; and to the last of these more particularly, as his early guide and exemplar, Wordsworth has expressly recorded his obligations in a stanza which, so far as we are aware, has hitherto escaped quotation:

"I mourned with thousands, but as one
More deeply grieved, for he was gone
Whose light I hailed when first it shone,
And showed my youth
How verse may build a princely throne
On humble truth."

With the charm of natural simplicity of manner, common to him with these his predecessors, Wordsworth, however, combined a depth of philosophic meditation peculiarly his own; there was born with him, moreover, a passionate susceptibility to effects of beauty in the material world, such as few men can ever have been gifted with; and out of these blended elements arose that mystical communion with nature which pervades the whole body of his poetry, and constitutes its truest claim to originality. By diffusion of this, and otherwise, his influence on our subsequent poetry has perhaps been as profound as any of the kind ever exercised, and it has been almost wholly beneficial. Yet we need not admire all we find in him. The early ridicule directed against him, though it sinned by excess and disproportion, was really to a great extent deserved. Had he gone on writing nothing but the "Betty Foy's" and "Alice Fells" which Jeffrey laughed at, we should not have had in this place to do a biography of him. It is despite of a good deal of this kind of perverse drivell, besides indifferent matter otherwise, and not in the least because of it, that he continues, and must long continue, to be remembered.—See the memoir by his nephew, bishop Wordsworth; and criticisms by Coleridge, Shairp, Hutton, and others.

WORK. To do work is to overcome resistance. If we try to lift a ton-weight, however we may fatigue ourselves, we cannot move it, and therefore we do no work. But we can lift with ease a hundred-weight, and then we do more work in proportion as we raise it higher. In lifting coals from a pit, the work done is evidently in proportion to the depth of the pit, and to the weight of the coals raised. This and numberless other instances are too well known to need further description. We may therefore at once define the *work done by a force as the product of the force into the space through which it moves its point of application in its own direction*, and it is usually measured by engineers and others who do not require absolute accuracy, in *foot-pounds*, the work required to raise a pound one foot high. If the motion of the point of application be in the *opposite* direction to that of the force, the work is done against the force. If the motion be per-

pendicular to the direction of the force, no work is done by or against the force. Thus, the work spent in projecting a curling-stone, in opening a massive gate, or in turning a large fly-wheel or grind-stone, has nothing whatever to do with the force of gravity—the body moved, in all these cases, is, as a whole, neither raised nor lowered as regards its distance above the earth's surface. If the direction of the force be oblique to the direction in which the point of application moves, we must resolve the force, by the law of the parallelogram of forces (see COMPOSITION OF FORCES), into two components, one *in* the direction of motion, the other perpendicular to it. The former is the working component; the latter, as we have just seen, does no work. A good illustration of this is found in the case of raising stones from a quarry by carting them up a series of inclined planes, as contrasted with hauling them up vertically. The work done in either case is measured by the product of the weight of the stones, and the height through which they have been raised; and thus, for the same load of stones, it will be the same whichever process is adopted. This is evident from the property of the inclined plane—viz., that the force required to support a body resting on the plane (which is the force that has to be overcome when we haul it up the plane) is to the weight of the body as the *height* of the plane to its *length*. Hence, this force, multiplied into the length of the plane, gives the same product as the whole weight into the height of the plane; and these are the two quantities of work we are comparing.

When work is done upon a body, there is always an increase of velocity unless other forces act on the body, so that it does an equal amount of work against them. Thus, if we push a movable body, such as a cart, along a road, the velocity gradually increases, and would increase indefinitely were there no friction and no resistance of the air (forces against which work has to be done), and could we move fast enough to keep continually pushing it, however great its velocity may become. If, on the other hand, by means of a rope and pulley, we raise a stone, if once started, it will ascend uniformly, so long as we pull with a force just equal to its weight, because, then, as much work is done on the stone by the hand as it does against gravity. If we pull with a force greater than its weight, we do more work on the stone than it does against gravity, and the upward velocity increases; if with a force less than the weight, the stone has to do more work against gravity than is done on it by the rope, and its velocity upward becomes less. The measure of the excess of work done on a body over that which it does against resistance is the *increase of the product of half the mass into the square of the velocity*—i.e., of what was formerly called the *vis-viva* of the body, what is now called its *actual*, or preferably, its *kinetic energy*. See FORCE. Hence, as it is evident that if a body, or system, be acted on by a set of forces which are in equilibrium, it will have no tendency to lose or to acquire velocity, its kinetic energy will remain unchanged, and therefore *as much work must be done upon it by some of the applied forces, as it does against the rest, in any displacement so slight as not to change the circumstances of the particular arrangement*. That is, when forces are in equilibrium on a body, if the body be slightly displaced, the sum of the products of each force by the effective component of the displacement of its point of application is zero—the product being positive when the force does work, negative when work is done against it. This is the celebrated principle of *virtual velocities*, the term virtual velocity having been, very inconveniently, applied to what we have called above the effective component of the displacement of the point of application of a force. It was often employed as the basis of the whole of statics, and very curious attempts have been made to give proofs of it (independent of the laws of composition of forces), especially by Lagrange. But the principle of work, or energy, of which that of virtual velocities is a mere particular case, and which is at once applicable to the whole range of dynamical science, is distinctly enunciated by Newton in a scholium to his third law of motion. See MOTION, LAWS OF. His words are memorable, and should be universally known—*Si æstinctur agentis actio ex ejus vi et velocitate conjunctim; et similiter resistens reactio æstinctur conjunctim ex ejus partium singularum velocitatibus et viribus resistendi ob earum attritionem, cohesionem, pondere, et acceleratione oriundis; erunt actio et reactio, in omni instrumentorum usu, sibi invicem semper æquales*. Newton has defined what he means by the velocity of an agent—viz., the component of the velocity of its point of application which is in the direction of the agent. He has also shown what is the measure of resistance arising from acceleration (see VELOCITY); so that, merely using modern terms instead of those employed by Newton, but in no wise altering the scope of the above remarkable passage, we have the following version of it: *Work done upon any system of bodies (literally, the parts of any machine) has its equivalent in work done against friction, molecular forces, or gravity, if there be no acceleration; but if there be acceleration, part of the work is expended in overcoming the resistance to acceleration, and the additional kinetic energy developed is equivalent to the work so spent*.

When work is expended in overcoming the resistance to acceleration, i.e., the *inertia* of a body, we have its equivalent in additional kinetic energy. When it is expended against gravity, as in raising a weight or bending a spring, we have it stored up in a dormant form as *potential energy*. See FORCE. When it is expended in overcoming friction, there appears at first sight to be no equivalent—but the comparatively recent researches of Joule (q.v.) and others have satisfactorily accounted for its disappearance, by proving its quantitative transformation usually into heat, sometimes into other forms of molecular energy. But to pursue this point would lead us again to questions already

treated at some length in the article *FORCE*. There is one remark, however, which it is important to make. In compressing a gas, in the receiver of an air-gun for instance, we can never recover as useful effect all the work expended. The reason is that a gas is *heated* by compression, so that part of the work spent is converted into this heat, conducted through the metal, and by the principle of *dissipation of energy* lost, at least in part, to man. Had we a gas which could not be heated by compression (take the imperfect analogy of a space filled with fine spiral springs), we should recover, by allowing it to expand, all the work expended in the compression.

One other remark remains to be made. It will be noticed that Newton speaks of the action of an agent as the product of the agent and the component *velocity* of its point of application. This is what we now call *rate of doing work*, or *horse-power*. Watt estimated a horse-power at 33,000 foot-pounds per minute, or 550 foot-pounds per second. This is probably too high; but it is constantly employed in engineering calculations. A curious quantity, sometimes employed as regards steam-engines, especially those employed for pumping mines, is the *duty*, which is measured by the number of foot-pounds of work done by a hundred-weight of coals supplied to the furnace. A similar mode of comparison is now applied to steam-engines for agricultural purposes, etc.

The quantity of work which can be got out of any machine, human, animal, or other, depends in many cases on the rate at which it is done, or the horse-power actually exerted. An average man can easily work at the rate of a horse-power for a few minutes at a time; but if he were to work at no other rate, he would do very little work in a day. Various singular investigations have been made, both theoretically and experimentally, as to the most profitable rate of doing work, and their results are highly interesting. But to discuss them properly would require more space than we can afford.

DESCRIPTION OF WORK.	Weight raised.	Velocity per Second.	Unit of Work per Second.	Length of Working Day.	Total Work in a Day.
	Lbs.	Feet.	Lbs. × ft.	Hours.	Lbs. × feet.
A man mounting an easy staircase, or an incline, without a load, his work consisting simply in moving the weight of his own body.....	143	0.5	71.5	8	2,059,200
A man raising weights by means of a cord and pulley, which renders necessary the return of the cord without a load.....	39.6	0.66 say 0.67	26.53	6	573,048
A man raising weights by his hands.....	44	0.56	24.64	6	532,224
A man carrying a weight on his back up an easy incline, and returning without a load.....	143	0.13	18.59	6	401,544
A man raising materials by a wheel-barrow, on an incline of 1 in 12, returning unloaded.....	132	0.065	8.58	10	308,880
A man throwing earth by a spade a height of 5 ft. 4 in.....	5.94	0.66 say 0.67	3.98	10	143,280
A man working a pin-wheel or a drum— 1st, at the level of the axle.....	132	0.5	66	8	1,900,800
3d, at bottom of wheel.....	26½	2.34	61.8	8	1,779,840
A man walking and pushing, or drawing horizontally, in a continuous manner.....	26.4	2	52.8	8	1,520,640
A workman acting upon a winch.....	17.6	2.5	44	8	1,267,200
A workman pushing and pulling alternately in a vertical direction.....	13.2	2.5	29	10	1,044,000
A horse harnessed to a carriage going at a walking pace.....	154	3	462	10	16,632,000
A horse harnessed to a carriage going at a trot.....	96.8	7.22	699	4.5	11,323,800
A horse in a mill, at a walking pace.....	99.0	3	297	8	8,553,600
" " at a trot.....	66.0	6.56	433	4.5	7,014,600
An ox in a mill, at a walking pace.....	132	2	264	8	7,603,200
Mule.....	66	3	198	8	5,702,400
Donkey.....	30.8	2.67	82.24	8	2,368,512

The above table, due to Poncelet, gives at least approximate notions of the horse power employed, and the whole work done, in a working day, by men and animals variously applying their exertions.

WORK HOUSE, the name given to municipal institutions, in England, in which paupers are supported and maintained. The earliest mention of them is to be found in stat. 13 and 14 Car. II. c. 12, authorizing workhouses to be erected in the cities of London and Westminster, to which rogues and vagabonds might be committed, by any two members of the "workhouse corporation," a board created by the act, with the view of restraining them from predatory habits, and compelling them to work for their living. The provisions of this act were, for the first time, carried into effect in the reign of William and Mary, when a corporation, headed by the lord mayor of London, fitted up a house in Bishopsgate street as a workhouse, one part of which, called the keeper's side, was devoted to the purpose contemplated by the act of Charles II.—viz., the reception of vagrants and disorderly persons committed by two governors; while in the other part, called the steward's side, poor children were lodged, and taught various employments and branches of education. A very few workhouses were afterward erected by local acts, but their general adoption throughout England was first provided for by act 9, Geo. I. c. 7, by which the churchwardens and overseers of the poor in any

parish or town, were empowered, with consent of the majority of the inhabitants, to establish a workhouse where the poor were to be lodged and maintained. Two or more parishes might unite in having one workhouse, and one parish might contract for the maintenance of its poor in the workhouse of another. Under this statute buildings began to be erected and hired all over the country, with great zeal, for workhouses, in which the whole poor were housed, industrious and profligate alike. Out-door relief, which had been prohibited by the above statute, was re-introduced by 36 Geo. III. c. 23, and before long became the rule under a variety of systems, by which assistance was carried so far as to be a bounty on indolence. The poor-rates rose immensely, and it became the subject of general complaint, that the able-bodied out-door pauper enjoyed a degree of comfort which destroyed all stimulus to exertion. The result was the passing of statute 4 and 5 Will. IV. c. 76, which has remodeled the whole administration of the poor-law, and greatly extended the workhouse system. The commissioners appointed by that act, and the public board substituted for these commissioners in 1848, and made permanent in 1867, have been empowered, under certain restrictions as to consents, to order workhouses to be built, altered, or enlarged as they see fit, and may make by-laws for their government, which the justices are to enforce. The various workhouse officers, including master, matron, schoolmaster, schoolmistress, nurse, porter, and superintendent of out-door labor, have all their proper functions assigned them. Persons having an order, either from the board of guardians, the relieving officers, or the overseers, are at all times entitled to admission; and in cases of necessity, applicants must be admitted without an order. If the house be full, the master is bound to refer the applicant to the relieving officer, whose duty it is to find him relief elsewhere. Casual poor wayfarers, admitted by the master or matron, are to be kept in a separate ward; and by 34 and 35 Vict. c. 108, the guardians of every union are bound to provide within their respective unions casual wards with such fittings as furniture as the poor-law board, in their judgment—regard being had to the number of casual paupers likely to require relief—shall consider necessary. There are various statutory enactments regulating the discipline of workhouses. Refusal to work at any suitable employment, intoxication, or other misconduct, is punished with imprisonment and hard labor, not exceeding 41 days. A pauper absconding with clothes or other property belonging to a workhouse, is liable, under 7 Vict. c. 101, and 13 and 14 Vict. c. 101, to imprisonment and hard labor. The usual rule, in accordance with which man and wife are separated, is, by 10 and 11 Vict. c. 109, relaxed when they are above 60 years of age. By 11 and 12 Vict. c. 110, persons professing to be wayfarers or wanderers are to be searched on admission, and any money found on their persons is to be applied to the common fund of the union; and any applicant for relief concealing such money is to be punished as a disorderly person. In every workhouse a register is to be kept of young persons under 16 years of age, who are hired as servants or bound apprentices, and the relieving officer is bound to visit them twice a year and inquire into their food and treatment. By 31 and 32 Vict. c. 22, a register of religious creeds is to be kept in every workhouse. By 29 and 30 Vict. c. 113, the poor-law board is empowered to direct the guardians to provide proper drainage, sewers, ventilation, fixtures, furniture, and medical and surgical appliances in every workhouse.

Workhouses are of various sizes. One of ordinary dimensions comprehends accommodations for 460 to 700 inmates of both sexes and different ages; others, in populous neighborhoods, as near Manchester, will accommodate 1500 inmates. Classification as regards sex and age is an important particular, and is usually well attended to. In some situations the able-bodied inmates work at field labor within boundary walls. There is no going in and out at pleasure. A workhouse is a sort of prison under stern, though not unkind discipline, and the leading principle always held in view is, that the offer of being accommodated shall act as a terror to idly-disposed persons, who are inclined to seek parish relief. The establishment of a workhouse really has this salutary effect; where there is no workhouse, the pressure on the poor-rates is generally excessive. A half-empty workhouse is thought a proof of good poor-law management.

In Scotland, the name workhouse is sometimes given to institutions for the support of paupers, but their correct legal designation is *POORHOUSE*. Previous to act 8 and 9 Vict. c. 83, establishments for the reception of paupers had been erected in many of the larger towns of Scotland, and the expense connected with their maintenance was considered a proper charge on the funds. Admission to these almshouses was granted as a matter of favor to the more deserving of the aged, infirm, and friendless poor. No system of discipline was enforced, as any improper conduct could at once be checked by expulsion of the delinquent.

Act 8 and 9 Vict. c. 83, which made a complete change in the poor-law system of Scotland, affords powers for the erection of new poorhouses, and for the enlargement and greater efficiency of those that previously existed. The classes of poor for whom they are designed are described as "the aged and other friendless and impotent poor," and "those poor persons who, from weakness or feebleness of mind, or by reason of dissipated or improvident habits, are unable to take charge of their own affairs." The parochial board of any parish, or combination of parishes, which contains above 5,000 inhabitants, may erect a poorhouse as soon as a resolution to that effect has been approved by the board of supervision. Two or more contiguous parishes, with the con-

currence of the board of supervision, may build a poorhouse for their common use; but no poorhouse can be built, nor any existing poorhouse enlarged or altered, until the plans have been approved by the board of supervision. The parochial boards of parishes, or combinations of parishes, in which there is a poorhouse, may receive poor persons from other parishes at rates approved by the board of supervision. When two or more parishes unite to build a joint poorhouse, the expense of its erection and maintenance is apportioned as determined by the parishes; and for the purpose of erecting, altering, or enlarging a poorhouse, power is given on certain conditions to borrow money on the security of the future assessments of the parish or combination.

Parochial boards were empowered by the above act, under the sanction of the board of supervision, to frame regulations for the management and discipline of poorhouses. But the board of supervision has found it expedient, for the sake of greater efficiency and uniformity of management, to frame a general code of regulations, which, with a few modifications for peculiarly circumstanced parishes, now form the existing rules by which the Scottish poorhouses are administered. The management of each poorhouse is committed to a house-governor and a matron, subject to the orders of a committee of the parochial board or boards of the parish or parishes to which the poorhouse belongs. There are minute provisions for the classification of inmates according to age and sex, the discipline, medical attendance, religious instruction, diet of the inmates, and the duties of the different officers. Each poorhouse is to be visited at least once a week by a committee of two or more members of the parochial board, who are to institute an inquiry regarding a number of specified particulars, the answers to which inquiries are to be submitted to the house committee at each meeting. There are at present about 65 poorhouses in Scotland in connection with 400 parishes. See PAUPERISM.

WORKING-DRAWINGS are the large plans prepared by engineers and architects to guide the workmen in executing the design. Many of these are on a large scale, all moldings and ornamental work having to be drawn out of the actual size of the work.

WORKING-PARTY, a body of soldiers told off, by command, to perform certain work or labor foreign to their ordinary duties. A small extra pay, called "working-pay," is allowed, averaging about 4d. a day.

WORKINGTON, a market-t. and sea-port of Cumberland, about a mile from the mouth of the Derwent, 7 m. direct n. of Whitehaven, and the same distance by railway. Its harbor, furnished with a breakwater and several quays, is safe and commodious. To the coal-mines in the vicinity the town chiefly owes its prosperity—great quantities of coals being exported—but iron-foundries, malt-kilns, flour-mills, ship-building yards, rope and sail-cloth factories, breweries, and chemical works are in operation. Salmon fishery is carried on in the river. Railways run n., s., and e. from Workington, establishing communication in all directions. In 1877, 291 vessels, of 37,558 tons, entered the port, and 676, of 85,865 tons, cleared. Besides coals, the exports are pig and malleable iron, and the imports timber, etc. Pop. '61, 6,467; '71, 7,979.

WORKS, BOARD OF. By 46 Geo. III. c. 142 (altered by 50 Geo. III. c. 52), the management and control of public works and buildings, of which the expenses are defrayed from the crown revenues or parliamentary grants, were intrusted to an officer called the surveyor of his majesty's works and public buildings, whose duties included the superintendence of the erection and repair of royal palaces, and buildings used for the various branches of government, and the management of public museums and parks. In 1832 the duties of this officer were transferred to the commissioners of woods, forests, and land revenues (see **WOODS AND FORESTS**); but this arrangement eventually resulted in a complaint that the crown revenue was applied too easily to the execution of public works and improvements, by which means the exchequer was deprived of the funds which were due to it in exchange for the civil list, and parliament was unable to exercise the proper control over an important branch of public expenditure. The department of public works was therefore again separated, in 1851, from that of the woods and forests, and placed under the management of a new board, called the board of works and public buildings, composed of a first commissioner, specially appointed, who is a political officer, and has a seat in the cabinet, together with the secretaries of state, and the president and the vice-president of the board of trade, who are *ex-officio* commissioners. In addition to the control over public works and buildings, possessed by the former united board, the board of works has also the management of the parks in the metropolis, including the public parks formed under recent acts, and of Richmond, Greenwich, Bushy, Phoenix, and Holyrood parks, and the public gardens at Kensington, Kew, and Hampton Court. Among the duties of the board are, the providing of public walks, and access to the national buildings and collections—a branch of administration which has, of late years, assumed a prominence which it did not formerly possess. The board is also charged with many arrangements and responsibilities connected with the making of new streets and roads, in London and elsewhere, and the erection and repair of public statues. The board of works is under control of the treasury, to whose sanction all large estimates for public works must be submitted. The treasury appoint the secretary, clerks, and other officers of the establishment; and with the sanction of the treasury, the commissioners appoint or employ such architects, surveyors, etc., as

may be necessary. The salaries and expenses of the department, and the charges for all her majesty's public works, are annually voted by parliament.

WORKSHOP REGULATION ACT. See FACTORY ACTS.

WORK SOP (anciently *Wirkensope*), a t. of Nottinghamshire, England, 24 m. n. from Nottingham, on the right bank of the Ryton, a branch of the Idle, and near the Chesterfield canal, which communicates with the Trent. It is situated near the northern extremity of Sherwood forest. The town is generally well built, and great sanitary improvements of drainage and sewerage have recently been effected. There is a fine old church in the Norman style, with two lofty towers. Worksope was formerly noted for its Augustine monastery, of which there are now few remains. Much barley is grown in the neighborhood, and malting is carried on to a great extent. There is some trade in flour, timber, etc. Worksope is a station on the Manchester, Sheffield, and Lincolnshire railway. Pop. '71, 10,402.

WORM FEVER is a popular name for the affection more scientifically known as *infantile remittent fever*. Although it is a disease which presents great differences in its course and symptoms, according to the circumstances which have given rise to it, its characteristic symptoms will be found to point (as sir Henry Marsh, the eminent Dublin physician, long ago observed) to the mucous membrane as the original seat of morbid action. The disease seldom occurs during the first year of life; but from the second to the twelfth year, it is an affection often met with. Premonitory symptoms usually occur, and may last for some days. These symptoms are thus described by Dr. Evanson: The child looks ill, and loses his color; he is languid or fretful; complains of pain in the head or belly, is drowsy, but rests badly, starting in his sleep, or grinding his teeth. The appetite fails, the tongue becomes loaded, and the breath offensive. Fever now sets in; or the attack may commence with high febrile symptoms, and be ushered in by a cold fit. When once established the fever is remarkable for the distinctness of the exacerbations, the daily number of which varies in different cases. There is, however, usually one well-marked exacerbation, occurring in the evening and lasting till morning, and followed by a profuse sweat. Three is a common number—namely, one in the morning, one in the afternoon, and a third at night. However cool and lively the child may at other times be it becomes fretful, hot, and heavy, as the exacerbation approaches. During the febrile period all the symptoms become aggravated. As the period of remission approaches these symptoms gradually become less severe, and more or less perspiration appears. As the general disease declines the intermissions become lengthened, while the exacerbations diminish in duration and in intensity. Worms are often present in remittent fever, and give rise to many of the above-named symptoms; but as the symptoms often remain after worms have ceased to be expelled, the latter cannot be regarded as being always the sole cause of this disease.

With regard to the treatment of remittent fever, the first point is to improve the condition of the intestinal canal, and to correct the morbid secretions poured into it. "From the deranged state of the secretions," says Dr. Evanson, "the occasional use of a mercurial is often very beneficial; and it may be given combined with an aperient or a diaphoretic, according to the circumstances. The powder of jalap, simple or compound, is that which we prefer, and the addition of some ipecacuanha increases the effect." He recommends the following formula: Powdered jalap, 30 grains; powdered ipecacuanha, 5 grains; calomel, 5 grains; white sugar, 10 grains. From 2 to 5 grains of this powder may be given every three hours, till the bowels are freely moved. He adds that, to give cold drinks and keep the body cool by light clothing, and the use of an airy apartment (while we enjoy quietness, and occasionally exclude the light), is essential to recovery. When the bowels are not irritable a solution of crystals of tartar (bitartrate of potash) given cold, in the form of *imperial* (see TARTARIC ACID), possesses many advantages, as it acts on the kidneys, while it allays thirst, and tends to keep the bowels open. In the more advanced stages, when debility sets in, we have found the mineral acids useful. They can be employed much sooner than quinine; but the latter may occasionally be prescribed at the close of the complaint. If there are decided signs of intestinal inflammation leeches must be applied to the abdomen; when there is mere intestinal irritability, Dover's powder and the warm bath will give relief. If diarrhea cannot be checked by other means, turpentine, in doses of one or two drops, rubbed up with gum-water, may be tried. In relation to diet, the great point is to avoid giving such food as leaves a bulky, indigestible residue. When convalescence begins change of air often affords remarkable benefit.

WORM-GRASS. See SPIGELIA.

WORMS, an island with an area of about 36 sq. m., belonging to the Russian government of Esthonia, and lying to the e. of Dagö. It is flat and generally well-wooded in the interior, and throws out numerous steep promontories, round which strong currents run, so that, often for months together, it is cut off from all intercourse with the neighboring islands of Oesel, Dagö, Runö, etc., as well as with the mainland; and thus the inhabitants, who are of Swedish origin, have remained unmixed with foreign elements. A stranger is a rare and astonishing phenomenon on this island; and he, in his turn, is not less surprised at the peculiar old Swedish dialect, the architecture, and the manners and customs of this small, poor, but happy insular people.

WORMS, an ancient and interesting but decayed t. of Hesse-Darmstadt, in a highly fruitful district on the left bank of the Rhine, 20 m. s.e. of the town of Darmstadt, and communicating with Mainz and Mannheim by railway. Pop. '75, 16,597. Among its churches, the chief is the cathedral, a massive building in the Byzantine style, with four towers, founded in the 8th, and completed in the 12th century. On a hill near the church called the *Liebfrauenkirche*, a highly esteemed wine, called *Liebfrauenmilch*, is grown. The manufacture of polished leather employs 1200 hands; tobacco is also manufactured, and a trade in the wines and the agricultural produce of the vicinity is carried on. Worms is one of the oldest cities of Germany, and is the scene of the *Nibelungen-Lied* (q.v.). It was occupied by the Romans, destroyed by Attila, and afterward rebuilt by Clovis. It was frequently the residence of Charlemagne and his Carolingian successors, was the place of convocation of many German diets, and was erected into a free imperial city by the emperor Henry V. The most famous diet held here was that at which Luther defended himself before Charles V. and the princes of the empire (commemorated by an imposing monument to Luther erected at Worms in 1868). The industry and commerce of Worms were great during the middle ages, and its pop., as far back as the time of the Hohenstaufens, averaged 60,000, and even amounted to 30,000 at the close of the thirty years' war, but it was almost wholly destroyed by the French in the destructive war of 1689; and though soon after it was rebuilt on a smaller scale, it has never recovered its former prosperity. The site of the old town is only partially occupied by the present one, the rest being laid out in gardens. Here, in 1743, an offensive and defensive alliance was entered into by Great Britain and Austria with Sardinia.

WORMS, AS A DISEASE OF INFANCY. As we have elsewhere (see ASCARIS, ENTOZOA, TAPEWORM, and VERMIFUGES) treated of the natural history of the worms infesting the human subject, and of the remedies to be employed for their expulsion, we shall mainly confine ourselves in this article to the symptoms which are usually considered to be indicative of the presence of worms in children. These symptoms are, however, in reality, only evidence of irritation of the mucous membrane of the intestinal canal, which may be due to other causes than worms, as, for instance, the presence of indigestible matter, unhealthy secretions, or the existence of a morbid condition of the membrane itself. "Indeed, the latter," says Dr. Evanson, "would seem necessary, in many instances, for the production of any symptoms, although worms were present; as they have been passed by children in perfect health, who experienced no inconvenience on their account. Even the evacuation of worms does not prove that the symptoms present were caused by them, though doubtless they are likely to have been aggravated thereby. The worm *may* have been but an accidental accompaniment—a morbid condition of the mucous membrane being the true source of the symptoms."—*On the Diseases of Children*, 4th ed., p. 345. Although all the symptoms commonly referred to the presence of worms may exist without them, yet there is a group of symptoms which pretty certainly indicate their presence, and which, when occurring together, should, at all events, excite our suspicions. These symptoms are divisible into (1) those dependent directly on the presence of worms in the intestines; and (2) those connected with the sympathetic relations of the digestive organs, and due to some form of reflex nervous action.

(1.) "Worms," says Dr. Evanson, "may be suspected to be present when a child looks pale and grows emaciated, while his belly swells and becomes hard—a gnawing, pungent, or twisting pain being felt in the stomach or about the navel. The appetite is usually precarious, at times voracious; the breath is fetid; and the bowels often deranged, being alternately purged or costive, and much mucus passed in the stools. There is commonly picking of the nose, or irritation (often excessive itching) is felt in the lower part of the bowels; and when a child is old enough, he may complain of a sense of sinking or fainting, which seems to attend particularly on the irritation caused by worms. When symptoms are present, and cannot be accounted for by the existence of disease of the mucous membrane or of the mesenteric glands, we have good reason for believing that worms are their cause."—*Op. cit.*, p. 347.

(2.) Among the most marked sympathetic symptoms are those of the head. The sleep becomes inquiet, and the little patient is liable to start up suddenly from slumber; grinding of the teeth is common; the pupils are often dilated, and there may be headache, and sometimes convulsions—symptoms painfully like those of hydrocephalus (q.v.), but often disappearing on the expulsion of worms. A dry cough, unaccompanied by any signs of disease of the thoracic organs, is regarded as a sympathetic or reflex symptom of worms; and vomiting, hiccough, diarrhea, tenesmus, and bloody stools often accompany their presence. The round-worm (*ascaris lumbricoides*) may be present in the small intestine (its ordinary seat) in large numbers without occasioning any disturbance; but when it does give rise to symptoms, the most prominent are sharp colicky pains about the navel, faintness, great emaciation, and voracious appetite. The thread-worm (*ascaris or oxyuris vermicularis*) chiefly occurs in the rectum, where it often exists in large numbers, looking like bits of cut thread. In a recently voided stool they are seen to be in rapid motion; hence they are called *ascarides* (from the Greek *askaridzein*, to jump), and hence also, in all probability, the great distress which they occasion as compared with the quiet round-worms. The characteristic sign of the presence of these thread-worms is the itching and irritation felt in the rectum.

WORMS, or VERMES (COMPARATIVE ANATOMY). Most zoologists regard the worms as constituting a subdivision of the ARTICULATA; but one of our latest and best writers on classification—prof. Huxley—confines the synonymous terms ARTICULATA and ARTHROPODA to the insects, myriapods, arachnids, and crustaceans; and places the higher worms, or *annelids*, with the above classes, in a primary division, or subkingdom, of ANNULOSA; and the less highly organized worms, *scolecids* (in which he includes the *rotifera* or wheel-animalcules, the *trematoda* or flukes, the *taniadae* or tapeworms, the *nematodea* or thread-worms, the *acanthocephala* and the *gordiacae*), in a subkingdom, to which he applies the term ANNULOIDA. The main reasons of his placing the worms under two great subdivisions are—(1) that the annelids resemble the arthropoda in the arrangement of the nervous system, which constitutes a ganglionated double chain, traversed at one point by the oesophagus; (2) none of the scolecids possess any characters in common with the arthropoda generally, or the annelids, other than those which they have in common with all animals. No scolecid has a definitely segmented body, or bilaterally disposed successive pairs of appendages, nor has it a longitudinal chain of ganglia. These grounds of difference outweigh, in his opinion, the many points of resemblance between the annelids and the scolecids—as (1) the resemblance between the ciliated larvæ in many cases; (2) the resemblance between the forms of the mature bodies of many scolecids with that of one of the most familiar of annelids, which is so close as to have acquired for the scolecids the popular name of “worms;” and (3) the fact that in the annelids we see the representatives of that singular system of vessels which attains a perfect development in the “water-vascular” apparatus of many scolecids. The final settlement of the classification of these animals must be decided by further investigation.

With regard to the general characters of worms, it is well known that they are usually of a very elongated form. In the higher groups the division of the body into a number of segments is very distinct; while in some of the lower forms no segmentation can be detected. The segments, when present, are usually homonomous, or, in other words, are mere repetitions of one another. The soft and contractile body may be cylindrical or slightly compressed, or it may be flat and broad, and usually presents a distinct dorsal and abdominal surface. The lateral region is often provided, in the higher forms, with special appendages, resembling minute stumps, which take part in the respiratory process. Among the cuticular appendages must be mentioned the bristles (*seta*), hairs, hooks, etc., which are often seen. The nervous system of the highest worms—the annelids—has been already sufficiently described in our notice of prof. Huxley's views. From this condition it appears in the scolecids to become more and more rudimentary, till in the parasitic worms it totally disappears. The mouth is absent in the lower forms, but in the higher lies in the mesial line of the abdominal surface, in close approximation to the chief nervous (pre-oral) ganglion, from which most of the organs of the senses derive their nerves, as the eye, the auditory apparatus, and the organs of touch (especially the lips). Some of the parasitic worms, as the tapeworms, etc., are totally devoid of an intestinal canal; others, as the turbellaria (with few exceptions), and the trematoda, have an intestine, but no anal aperture; while the rest have an intestine provided with both mouth and anus. The latter, when present, lies on the posterior part of the body, and sometimes (as in many turbellaria) on the dorsal surface. Except in the geophyrea or sipunculacea, the intestine, when present, is simple, and devoid of convolutions; but is often, as in the leech, provided with lateral blind sacs. The vascular system in the most highly organized worms consists of a closed system of arteries and veins, presenting modifications in different genera. A large vessel which runs beneath the dorsal integument may be seen under a microscope to contract and propel the blood forward, thus fulfilling the functions of a heart, and being the homologue of the dorsal vasiform heart of insects; while a corresponding venous trunk conveys the blood in an opposite direction, and runs along the under surface of the body. These great trunks are united at each segment by transverse vessels, which carry the blood from the ventral vein to the dorsal artery. In the nematelmia, or parasitic round-worms, the system is much simpler; and in the lowest worms no trace of true blood-vessels is discernible. None but the annelida (q.v.), or highest worms, possess special respiratory organs. These occur in various forms. Thus, in the leech and earthworm, a series of pores on each side of the body lead to as many simple sacculi formed by an inward folding of the integument. In the tubicolous annelids, such as the *serpula* (a common inhabitant in the aquarium), the respiratory organs are in the form of long flattened branchiæ, radiating from the head, and generally disposed in a spiral form. When not filled by the red circulating fluid which the annelids generally possess, they are often beautifully tinted with purple, green, and yellow colors, and form a gorgeous crown. In the *arenicola piscatorum* (figured in the article ANNELIDA), the respiratory organs are seen lying as lateral tufts in the middle part of the body (14 or 16 in number on each side). In the lower worms, there are no definite respiratory organs, the process being carried on partly by the surface of the skin generally, and partly by the water-canals noticed in the article TAPEWORM. As a general rule the worms are hermaphrodites, only one of the five classes into which they are divided—viz., the *nematelmia*, having the sexes separate. A large number of the lower kinds are parasitical; the others are inhabitants of sea and fresh water, mud, earth, etc.

The worms are arranged by V. Carus into the five following classes: (1.) *Annulata*,

corresponding to the *annelids* of Owen, and described in the article *ANNELIDA*. (2.) *Gephyrea*, including the *sipunculus* and its allies. (The term is derived from the Greek *gephyra*, a bridge, because the animals included in it form a connecting link or *bridge* between the *echinoderms* and the true *articulate animals*.) In the article *Sipunculus* (q.v.), in which, according to the old view, that animal is regarded as an *echinoderm*, there is a figure of a British species, the *sipunculus Bernhardus*. (3.) *Chaetognatha* (signifying *shaggy-jawed*, from the Greek *chaîtêcis*, shaggy, and *gnathos*, a jaw), including the single genus *sagitta*, which was formerly erroneously placed among the *nucleo-branchiated mollusks*. As the *sagitta* is not elsewhere described in this work, we may notice that it is a little fish-like animal with a distinct head, the mouth armed with several pairs of lateral hook-like jaws, with an elongated body furnished with one or two pairs of fin like organs, and with a broad and usually bilobed caudal fin. The *sagitta* (so called from its arrow-like appearance) is of small size, swims with great rapidity, and is common in the Mediterranean and in the North sea. (4.) *Nematebmia* (from the Greek *nêma*, a thread, and *helmins*, a worm), which are described in a special article. (5.) *Platyelmia* (from the Greek *platys*, flat, and *helmins*, a worm), or *flat-worms*, which are divisible into the three orders: (1) *Turbellaria*, including the planarias, etc.; (2) *Trematoda*, including the flukes; and (3) *Cestoulea*, including the tapeworms. These orders are described in special articles.

For further information on the subject of this article the reader is referred to the various works and memoirs of Milne-Edwards, Grube, De Quatrefages (especially his *Rambles of a Naturalist*), Schmarda, Blanchard, Leuckart, Williams of Swansea (in the reports of the British association), etc. The British worms were not till quite recently described by any competent naturalist, although the labors of Williams of Swansea and Johnston of Berwick (both too early lost to science), are excellent as far as they go. Dr. Johnston's *Catalogue of the British Non-parasitical Worms in the Collection of the British Museum* (Lond. 1865, p. 366), with 20 plates, must be consulted by all who take an interest in this subject, although much of it is now out of date. The most complete work is the *Monograph of British Annelides*, published under the auspices of the Ray society by Dr. Macintosh of Murthly, one of the most distinguished of the younger generation of Scottish naturalists.

WORM-SEED is the popular name for *santonica*, from which *santonine* (q.v.) is extracted.

WORMWOOD is the popular name for *artemisia absinthium*. It not only acts as an anthelmintic, as its name implies, but it likewise possesses tonic and stimulant properties, which prevent the reproduction of worms after their expulsion. An *infusion of wormwood*, made by pouring a pint of boiling water over an ounce and a half of the dried plant, letting it stand for an hour, and straining, taken in doses of a couple of ounces once or twice a day, is a very good domestic tonic, and may be prescribed with advantage even in cases where worms are not suspected.

WORSAAE, JENS JACOB ASMUSSEN, a distinguished Danish archaeologist, was b. in 1821 at Veile, in Jutland, where his father held the post of *justitsraad*, or counselor of justice. Worsaae received the rudiments of his education at the gymnasium of Hørsens, from whence he proceeded, in 1833, to Copenhagen, with the intention of studying theology. Having, however, soon exchanged his theological studies for law, and again as speedily relinquished the latter, he turned his whole attention to the history and archaeology of the north, which had from an early age presented special attractions to his mind; and in 1838 he obtained the place of assistant in the Royal museum of northern antiquities at Copenhagen, which was then under the direction of the able Danish archaeologist, C. J. Thomson, to whom this most valuable collection owes its origin and its present state of excellence. In 1844 appeared Worsaae's important work, entitled *Rundt om Broralla Slægt*, in which he, with consummate skill and profound erudition, definitely settled the long-pending doubts as to the authenticity and character of the Bleking rock inscriptions, and satisfactorily showed that the supposed runes were no runes at all, but the mere weatherings of the rock; and consequently that the interpretation given by the great Icelandic scholar, Finn Magnussen (q.v.), had no existence but in the mind of its author. This bold but conclusive solution of a long-pending problem, which, from the days of the great Danish historian, Saxo Grammaticus, had occupied the attention of the most learned men of the north, at once placed Worsaae, in the foremost rank of northern archaeologists; and the numerous works and monographs which have appeared from his pen since then have fully justified the high promise given by his early labors. During the ten years intervening between this period and his nomination in 1854 to the honorary rank of professor in the university of Copenhagen, Worsaae made repeated visits to the other Scandinavian lands, to Great Britain, Germany, France, and other parts of central Europe, which retained traces of the former presence of the Northmen. The Danish government defrayed the expenses of several of these journeys, the results of which have been the publication of numerous works and papers of interest, among which we may instance his *Minder om de Danske og Nordmændene i England, Skotland og Irland* (Copenhagen, 1851); or *Memorials of the Danes and Norwegians in England, etc.*, of which an English translation appeared the following year; and his treatise *Om en forhistorisk saakaldet tysk Befolkning i Danmark* (Copen-

1849); etc. Some of the most important of his works on the archæology of his native country are his *Danmarks Oldtid oplyst ved Oldsager* (Copen. 1843); *Blekingske Mindesmærker fra Hedenold* (1846); *Danerirke* (1848); *Den Danske Erobring af England og Nørmandiet* (1863); *Om Slægtens Oldtidsminder* (1865). Worsaae has always shown himself a warm patriot, and a strenuous opponent of the spread of German tendencies in the duchies, and his views in this direction were forcibly enounced in his *Jylland's Danskhed*, a treatise published in 1850, and especially directed against Jacob Grimm's exposition of the question of German national law. Worsaae's merits have been fully recognized by his countrymen; and the Danish government has constantly shown its sense of the estimation in which he was held, by placing him at the head of all important commissions connected with the archæology of the country, appointing him to important posts in connection with the university and antiquarian museums, and bestowing upon him various other marks of confidence and respect.

WORSTED. Besides the application of this term, explained under **WOOL** and **Woolen Manufactures** (q.v.), it is also applied to the thick loose woolen yarn used for knitting stockings, etc., known in trade as *fingering-yarn*.

WORT. See **BEER**.

WORTH, a co. in s.w. Georgia, partly bounded on the w. by Flint river, drained by Little river; 800 sq.m.; pop. '80, 5,892—5,888 of American birth, 1824 colored. Co. seat, Isabella.

WORTH, a co. in n. Iowa, having the state line of Minnesota for its n. border, drained by Shell Rock river and Lime creek; 432 sq.m.; pop. '80, 7,953—5,132 of American birth, 9 colored. Co. seat, Northwood.

WORTH, a co. in n. Missouri, having the state line of Iowa for its n. boundary; 280 sq.m.; pop. '80, 8,208—8,031 of American birth, 1 colored. Co. seat, Grant City.

WÖRTH, a village of Alsace-Lorraine, situated at the confluence of the Sauer and the Salzbach, about 10 m. s.w. of Weissenburg. Here, on Aug. 6, 1870, the French, under MacMahon, were outflanked and defeated with great loss by the Germans, commanded by the crown prince, who took 4,000 prisoners. Wörth suffered considerably during the battle, hand-to-hand fighting taking place in its streets. Pop. over 1000, mostly Protestants.

WORTH, WILLIAM JENKINS, 1794—1849, b. Texas, entered the U. S. army as a private in 1812; distinguished himself at Chippewa and Lundy's Lane; was promoted, and from 1820—28 was instructor in tactics and commandant of cadets at West Point. He served with rank of col. in the Seminole war, and at its end was brevetted brig-gen. In the Mexican war he commanded a brigade, and later a division, and took part in the battles of Cerro Gordo, Churubusco, Molino del Rey, Chapultepec, and at the capture of Monterey, Vera Cruz, and the city of Mexico. He was brevetted maj-gen. and presented with swords of honor by congress and by the states of New York and Louisiana. A monument was erected over his remains by the city of New York, on the n. side of Madison square.

WORTHING, a fashionable and rapidly-rising watering-place on the Sussex coast, 10 m. w. of Brighton. Pop. '61, 5,805; '71, 7,413. Its importance began with the century, as, prior to that date, it was merely a small unvisited fishing-village. The climate is much milder than that of Brighton, the town and its immediate neighborhood being encircled on the n. and n.e. by almost an amphitheater of hills, which greatly shelter it from northerly winds, and render it one of the best places for a *winter* resort on the s. coast. The town has no noxious trades or manufactures, but is essentially a place of resort for pleasure-seekers and invalids. It has one of the finest and longest sea-parades in the kingdom, being nearly 2 m. in length. The town has an excellent system of drainage, and is well supplied with water; while its mortality tables show a rate of only 14.5 per 1000. It is the neighborhood of Worthing that Dr. Richardson chose as the site of the ideal Hygeia or city of health shadowed forth by him in 1875.

WOTTON, Sir HENRY, 1568—1639; b. England; educated at Winchester and Oxford. After a prolonged tour on the continent he returned to England, and became secretary to the earl of Essex. He went with him to Spain and Ireland, but upon Essex's arrest upon a charge of treason escaped to France. He went to Scotland in 1602, charged by the grand duke of Tuscany to warn James of a plot to take his life. He returned to England after the death of Elizabeth, was knighted, and in 1604 made ambassador to Venice where he remained till recalled in 1610. He resumed the Venetian embassy in 1616, having previously gone on a diplomatic mission to the Netherlands. In 1625 he took deacon's orders, to make him eligible for the provostship of Eton college, which he held till his death. He wrote several works which are forgotten, with the exception: of his poems.

WOTTON, WILLIAM, D.D., 1666—1726; b. England; educated at Cambridge, and ordained to the English church. Among his works is a *History of Rome* (1701). He is best remembered, however, by his *Reflections upon Ancient and Modern Learning* (1694), which began the famous dispute about the authenticity of the *Epistles of Phalares*, and drew out Swift's *Battle of the Books*.

WOUNDS may be defined to be divisions of soft parts produced by external mechanical force. They have been classified by surgical writers in various ways, but the most useful arrangement is that which is adopted by Mr. Paget, in his admirable memoir on "Wounds," in Holmes's *System of Surgery*, and is based on their mode of infliction. They are thus divided, first, into *open* and *subcutaneous* wounds: the former including those in which the outer part of the wound is almost or quite as extensive as the deeper part; and the latter, all those in which the outer part of the wound is very much smaller than the deeper part. These wounds (especially those of the first kind) may be further divided into (1) *incised wounds*, such as cuts or incisions, including those which remove a portion of the body; (2) *punctured wounds*, such as stabs; (3) *contused wounds*, in which the divided parts are bruised or crushed; (4) *lacerated wounds*, in which there is tearing of the tissues; (5) *poisoned wounds*, in which some poison or venom is inserted; and to these may be added, as a special variety, (6) *gunshot wounds*.

Simple, open, incised wounds will be more fully noticed than any of the others, because they have been most fully studied, and in their surgical relations are the most important. In a clean cut, whether made accidentally or in a surgical operation, three things are chiefly to be observed—viz., the opening or gaping by the retraction of their edges, the bleeding, and the pain. The *gaping* of a wound is caused by the retraction of the various tissues which are divided. Of the various tissues, the skin exhibits the greatest degree of retraction, and then (in the order in which they stand) elastic tissue, cellular or connective tissue, arteries, muscles, fibrous tissues, nerves, and cartilages. In addition to the immediate gaping of fresh wounds, many wounds, if they be not prevented, will continue to retract for a long time. For example, in stumps that heal slowly, the limb terminates in a cone, in consequence of the prolonged retraction of the muscles. The *bleeding* from an incised wound depends chiefly on the size and number of the divided vessels, and on their connection with the surrounding parts, but to a certain extent on the previous condition of the wounded part, or on the peculiar constitution of the patient. Gradually, with or without surgical help, the vessels cease to bleed; and then, if the wound be left open, there is an oozing of blood-tinged serous fluid, succeeded gradually by a paler fluid, which collects like a whitish film on the surface, and contains an abundance of white or colorless blood-cells, imbedded in a fibrinous (and therefore spontaneously coagulating) fluid. The nature of the *pain* cannot be made clear by any description to those who have not felt it; and it is more than probable that a similar wound inflicted on two or three persons would occasion different degrees of pain in each. There are also differences, as Mr. Paget has pointed out, "in both the kind and degree of pain, according to the place and manner of the wound. Thus, in regard to the skin, wounds of the face and of the extremities of the fingers and toes, seem to be among the most painful; those of the back among the least so; and wounds cut from within are less painful than those from without. The skin appears far more sensitive to wounds than any of the deeper structures, except the nerves of sensation themselves; but any part (as periosteum or tendons) may become, by disease or distention, highly sensitive."—*Op. cit.*, p. 581. The *local consequences* of an incised wound are indicative of inflammation. In the course of an hour or more, the edges of the wound and the adjacent parts become swollen and abnormally sensitive, feel hot and aching; the sutures (if any have been inserted) become tighter, and the edges and intervening spaces gape in consequence of the swelling. These symptoms gradually subside in two or at least four days, unless there is some abiding source of irritation. Except in very severe wounds, no *general consequences* are apparent. In these exceptional cases, as in amputations, for example, a shock and subsequent reaction (both of which are described in the article *Shock*) are observed. The duration of this feverish reaction or traumatic fever does not seem to bear any fixed relation to the severity of the injury. Sometimes it subsides within 24 hours; more often, after large wounds, it does not subside for three or four days, when the pulse and breathing gradually return to their natural standard, and the skin becomes soft and cool. The beginning of suppuration often coincides with the subsidence of the fever. If the fever should last more than four or five days after the receipt of the injury, there is probably some persistent irritation or some morbid complication.

The *healing* of open incised wounds may be accomplished, according to the high surgical authority from whom we have already quoted, in five different ways, if we include those in which the process is assisted by treatment—viz., (1) by immediate union, or (in surgical language) by union by the first intention; (2) by primary adhesion, or union by the adhesive inflammation; (3) by granulation, or by the second intention; (4) by secondary adhesion, or the third intention—i.e., by the union of granulations; and (5) by scarring under a scab, the so-called subcutaneous cicatrization. *Healing by immediate union* takes place when the wounded parts being placed and maintained in contact, first stick together, and then become continuous, without the formation of any new material as a connecting medium. For example, a flap of skin is raised by dissection in the removal of a tumor or a mammary gland, and is then replaced on the subjacent parts. In three days at most, the union may be complete, without any indication of inflammation, there being no evident efflux of blood, no exudation of reparative material, and no scar. In *healing by primary adhesion*, lymph exudes from both cut surfaces, becomes organized, gradually connects the cut surfaces, and at length forms between them a firm

layer of connective tissue, covered with a thin shining cuticle. These steps are well seen after the operation for hare-lip, for example. In *healing by granulation*, the wound becomes coated over with the white film, containing colorless blood-cells, as already described. If these glazed surfaces are brought and kept together, they will probably unite, the film becoming organized, and contributing to form a bond of union; but if the wound be left open, the film increases, and takes part in the formation of granulations (q.v.). We cannot enter into the life history of these granulations, and can only remark, that they are finally developed into a scar, consisting of fibro-cellular or connective tissue, with a superficial layer of epidermis. The completion of the healing is accomplished by the gradual improvement of the scar, in which the connective tissue becomes more perfect in its character, and the cuticle becomes thicker and more opaque. *Healing by secondary adhesion*, or by third intention, "is accomplished by the union of two granulating surfaces (e.g., those of two flaps after amputation) placed and maintained in contact. In this state the two surfaces simply unite, or else new material, produced from either or both surfaces, adheres to both, is organized into continuity with both, and then unites them."—Paget, *op. cit.*, p. 586. *Healing by scabbing*, or under a scab, is, according to the same authority, the most natural, and in some cases the best of all the healing processes. In animals, it is often observed that if a wound be left wide open, the blood and other exudations dry on its surface, and form an air-tight covering, under which scarring takes place, and which is cast off when the healing is complete. In man, this process is less frequent, because, in the first place, exudations seem to be more often produced under the scab, which detach it, and prevent the healing; and secondly, surgical interference seldom allows this method to have a fair trial.

Such are the several modes of healing of simple, incised, and all open wounds. We have now to consider the nature of the processes therein concerned. Every wound is followed by more or less tendency to an inflammatory process. This tendency may not proceed beyond an increased sensibility of the part and a slight efflux of blood, and there may be no inflammatory exudation; and this is the best condition for healing by immediate union in which no new material is required; or the inflammatory process may go on to the production of lymph, and then cease—a condition essential to healing by adhesion. In healing by granulation, a very low degree of inflammation (such as is requisite for the effusion of the first materials for granulation) is best; while for healing by secondary adhesion or by scabbing, inflammation must be altogether absent. The due understanding of these relations of inflammation and the healing processes of open wounds, affords important aid as to the *mode of treatment*. Nothing should be done to excite or increase inflammation. So much as may be necessary for some of the modes of healing, is sure to occur spontaneously, and more will only do harm; on the other hand, the inflammation excited by the wound does not require special treatment, except in the case of organs (such as the eye, the peritoneum, the lungs, the large joints, etc.), in which serious mischief may be very rapidly induced by inflammation. The position of the wounded part is a subject of considerable importance. "When comfort has, as far as possible, been secured, the next object should be that the wounded part should be relaxed, so that the edges of the wound may come near or together; that no part, and especially no muscle, should be on the stretch, and that the direction of the wound may be such as will allow fluids to flow away from some part of it." In the great majority of cases, healing by immediate union, or by primary adhesion, is most desirable, and should be aimed at—the exceptional cases being wounds through many structures, and exposing considerable surfaces of deep-seated bone; deep wounds whose depth far exceeds their length; wounds of which the deeper portions of the sides cannot be kept in good contact; wounds through parts in a very inflamed or otherwise disordered state; and those which are likely to be troublesome from secondary hemorrhage—in all of which there is a fear of the collection of blood and other fluids under the closed integuments. In attempting to induce healing by either of these modes, the points to be attended to are—the arrest of the bleeding, the cleaning of the wound, the exact apposition of its edges, and their maintenance in this position, and the exclusion of the whole wound from the air. If the bleeding arise from vessels of considerable size, they must be tied, twisted, and pressed (according to Simpson's plan) or crushed at their ends; but all these means, and especially ligature, should be avoided if possible, because they are impediments to exact union; and spontaneous closure of the vessels by the action of cold air or water, and pressure with dry lint, is preferable. The cleaning of the wound is best effected by allowing a gentle stream of water to flow over it. Soft sponges are sometimes useful for this purpose; but they must be used as dabbing (not as scrubbing) agents, and the greatest attention must be paid to their cleanness: the sponge used for the wounds or sores of one patient should *never* be applied to those of another. Apposition is effected by padding and bandaging, sutures (q.v.), and adhesive plasters—the former being useful in deep wounds, while the latter two serve for more superficial wounds. Although a simple incised wound, after its sides have been thus brought into complete contact, may be left exposed to the air, some covering to exclude the air is deemed preferable. Whatever is used should be light, not adhesive, and not prone to decomposition—its object being to protect the wound probably from a deleterious action of the air, and more certainly from sudden change of temperature, friction, and dust. Nothing is better for this pur-

pose than lint soaked in oil, or simple cerate on perforated linen. The following remarks on the dressing of wounds are condensed from Mr. Paget's memoir. No general rule can be laid down regarding the time at which any or the whole of the dressings should be removed. In small wounds about the face, union may be complete in two days; but it is not so firm as to be safe from probable accidents, and metallic sutures possess the advantage of exciting so little irritation, that they may be left in their places for any length of time, till union is perfectly secure. They should therefore not be removed for four days, or, in the case of large wounds, for a week, or longer. They should not all be removed at once, and those that are removed should be replaced by strips of adhesive plaster; the union or scar must be cleaned most gently, and protected from the plaster with oiled lint. If, on the first dressing, the union or adhesion of the wound is progressing favorably, then it will usually be sufficient to dress it subsequently on every second day; and if all goes well, the union of small wounds may be regarded as safe at the end of a week, and that of larger ones at the end of ten days or a fortnight.

The rules which we have here given for inducing healing by immediate union or by primary adhesion may, in an emergency, be carried out by any intelligent reader, and ought to be generally known. We do not enter upon the modes of inducing the forms of healing by granulation and by secondary adhesion, as they ought to be carried on under surgical superintendence; nor do we notice the last mode—that of healing under a scab—because it is simply leaving the wound to nature; the most that is required in this case in the way of auxiliary treatment being to cover the scab with dry cotton-wool, to protect it and the subjacent surface from any causes that may excite inflammation.

Of the other varieties of wounds, it is sufficient to notice the most important points severally peculiar to each variety. Of *punctured wounds*, the most serious are those which are made with blunt-pointed instruments, such as nails, pitch-forks, iron spikes, etc., for by these the injured parts are not so divided as that they may retract, but are pressed aside with much bruising, and can close again as soon as the instrument is withdrawn; and in this lies the chief danger of these wounds, because blood or other fluids are likely to extravasate into them, and cannot readily escape. These fluids, by decomposing or by mere pressure, may excite inflammation, and thus cause deep and confirmed suppuration, and great destruction of tissues. Some of the worst forms of these wounds are those produced by sharp teeth, probably (as Mr. Paget suggests) because of the force with which, as they tend to meet, the teeth crush the intervening parts. In *contused wounds*, the great question is whether their union should or should not be attempted. If union is to be attempted, the rules given for the treatment of incised wounds must be followed, especial attention being paid to their careful cleaning, the removal of clots of blood, and their warm covering with some soft material, as cotton-wool. When it would be useless, from the extent of the bruises, etc., to attempt union, the following rules, as laid down by Mr. Paget, should be adopted: "The part should be kept at rest, and as nearly as possible at its natural temperature. For the latter purpose, and for protection, an excellent dressing is lint or cotton-wool thoroughly soaked in olive oil, and completely fitted to the part. Dry cotton-wool may be applied over this, or oiled silk. Water-dressing may be similarly applied, or warm poultices, but they are generally less comfortable. Irrigation is, in some cases, very soothing, especially in ragged wounds, but it should be with tepid water. The methods of the dressing, after the first, may be almost the same as for incised wounds."—*Op. cit.* p. 598. The treatment of *lacerated wounds* is almost precisely the same as that of contused wounds. *Poisonous wounds* are sufficiently discussed in the article *VENOMOUS BITES*; and there is a special article on *GUN-SHOT WOUNDS*, which are, in reality, only an important variety of contused wounds.

In conclusion, it must be mentioned that various kinds of wounds are liable to certain complications, of which some are local, and others general or constitutional. Among the former are recurring or secondary bleeding, pain, spasmodic muscular movements, and the presence of foreign bodies; while the latter include defect or excess of reaction, traumatic delirium, fever, erysipelas, pyæmia, etc. Some of these complications are treated of in special articles of this work; and for the treatment of the remainder, we must refer to Mr. Paget's memoir, from which most of the details of the present article are borrowed.

WOUVERMANS, PHILIP, a Dutch painter of note, was born in 1620 at Haarlem. From his father, Paul Wouwermans, a historical painter, he inherited a taste for art. He studied first with his father, and afterward with John Wynants. He passed his entire life at Haarlem, in the assiduous practice of his art, and died in the year 1668. Though his pictures are now highly valued, he is said to have had little immediate success, and to have lived in poverty, pretty much in the hands of the picture-dealers. His pictures are, for the most part, landscapes of small size, with figures profusely introduced, commonly in energetic action. His battle-pieces, in particular, are greatly admired for their spirit and vigor. He had two brothers, also painters, JOHN and PETER, who executed subjects somewhat similar, and whose works have not unfrequently been attributed to him; but, though both artists of considerable merit, they are plainly much inferior to Philip.

WRACK, or **SEA-WRACK**, a name sometimes applied indiscriminately to many of the larger *algæ* of the sea-shores, but also employed to designate the species of the genus *fucus* (see **FUCACEÆ**). Some of the most abundant of which are employed on the British shores for the manufacture of kelp (q.v.), and are also much used as a manure. The genus *fucus* has a leathery, dichotomous, generally flat, linear frond, usually furnished with large air-cells, which are included in the substance of the frond; the spores arranged in tubercles, imbedded in mucus, and collected in *receptacles*, through the pores of which they are finally discharged. *F. vesiculosus*, popularly known as *sea-ware*, *kelp-ware*, and in Scotland as *black tang*, is extremely abundant on all the rocky shores of Britain, growing between high and low water mark, and most plentifully near high-water mark, often struggling for existence on the very upper line, and even found among grass and moss in marshy ground occasionally overflowed by the tide. It is the species chiefly employed in the kelp manufacture, because it is more easily collected than any other. It is of a dark olive green color, sometimes 2 or 3 ft. in length; the frond flat, entire on the margin, with a central rib; the air-cells spherical, in pairs, sometimes as large as hazel-nuts; the receptacles solitary, terminal, turgid, compressed, mostly elliptical. Oxen, sheep, and deer eat it, and seek it on the sea-shore in winter when other food is scarce. In Gotland it is boiled and mixed with a little coarse flour as food for hogs. It has been used medicinally in glandular affections, probably owing its value to the iodine which it contains.—*F. nodosus* is another very common British species, sometimes called **KNOBBED WRACK**, growing nearer to low-water mark than the last, and therefore not so often and easily accessible, but esteemed the very best species for the manufacture of kelp. It has veinless fronds, branched in a somewhat pinnated manner, with large solitary egg-shaped air-cells in the central line of the frond. It sometimes attains a length of 6 feet.—*F. serratus* is also very common, and is easily distinguished by its serrated fronds, and the want of air-cells. It is sometimes called **BLACK WRACK**. It is less useful for kelp than the other species. In Norway it is used as food for cattle, generally sprinkled with a little meal. It is preferred to other species for packing crabs and lobsters to be sent to market, as it keeps them moist, while, having less mucus than the other species, it is less apt to ferment and putrefy. Some other species of *fucus* are common British *algæ*, although much less abundant than these. The use of wrack for manure is of great advantage to farmers on the sea-coast. This kind of manure is better adapted for light than for clay soils. The effect is beneficial for almost all kinds of crop. The wrack ought not to be allowed to lie long in a heap, as it is injured by fermentation, but as quickly as possible applied to the land, and covered by the plow.

Some of the *fuci*, as *F. vesiculosus* and *F. serratus*, on receiving injury by which any part of the frond is broken, throw out a cluster of young sprouts from the injured part.

WRANGELL, FERDINAND, Baron von, b. Russia; entered the navy, and in 1820 led a sledge expedition to the polar regions, co-operating with Anjou, which reached 72° 2' n. lat., discovering but not reaching the open polar sea, and also failing to reach the large tract discovered and called Wrangell's Land by Long in 1867. From 1829 to 1834 Wrangell was governor of Russian America, and in 1847 was made vice-admiral. Accounts of his expedition have been published in German and English.

WRANGLER, the name given at the university of Cambridge to those who have attained the first class in the public mathematical honor examinations. These examinations extend over eight days, the *pass* in the papers of the first three entitling a student to the degree of bachelor of arts, with honors of the third, second, or even first class, according to the number of marks attained. The word wrangler is derived from the public disputations in which candidates for degrees were in former times required to exhibit their powers. The examination is confined to mathematics, pure and mixed; it is conducted by two moderators and two examiners. At the end of the three days an alphabetical list of those who have attained sufficient marks to entitle them to a degree and honors in mathematics is published. All appearing in that list are entitled to appear at the following five days of examination. In the final list, which shows the number of marks obtained during the eight days, each candidate is placed in order of merit. The honor men who compose the mathematical *tripos* number usually from 120 to 150, and are divided into three classes—*wranglers*, *senior optimes*, and *junior optimes*. The head of the *tripos* is called the *senior wrangler*. The number of wranglers varies from year to year. It has rarely been under thirty-five, and has often been forty-five or upward, the number not being limited otherwise than through the application of a certain high standard of excellence.

WRASSE, or **ROCK-FISH**, *Labrus*, a genus of fishes of the family *labridæ* (q.v.), of the section having cycloid scales, *cyclolabridæ* of Müller. They have spiny fins, large thin scales, and an uninterrupted lateral line. The mouth is protrusible, with thick fleshy lips, folded so as to appear double. The teeth on the jaws are simple, in one or more rows; the lower pharyngeal bones are completely fused together, and have broad grinding teeth. The form is somewhat perch-like, with the back more straight. There is a single long dorsal fin, the spines of the anterior portion of which are surmounted by short membranous filaments, the posterior portion having short and split rays. The

ventral fins are under the pectorals. The colors are generally very brilliant. The species are numerous, abounding in tropical seas, but several of them are found on the coasts of Britain. They chiefly frequent rocky shores, and are generally seen in small shoals, often hiding under sea weeds. They feed on crustaceans, mollusks, and marine worms. They are often caught by bait intended for other fish, but their flesh is not much esteemed. The BALLAN WRASSE (*L. bergylla*, or *maculatus*) is one of the most common British species. It attains a length of about 18 in., and a weight of more than 3 pounds. It is bluish-green, paler on the belly, all the scales margined more or less broadly with orange-red, the blue prevailing in some specimens, and the orange in others. The COOK WRASSE (*L. mixtus*, or *variegatus*) is not unfrequent on the southern shores of England. Its prevailing color is orange, striped transversely with blue, particularly in the male, the colors of the sexes differing so much that the female has often been described as a distinct species, and is generally known as the RED WRASSE. There are several other British species of this and closely allied genera, as the CORKWING (*crenibubus melops*, or *linca*), about 6 in. long, and of a greenish-blue color, varied with yellow. The colors quickly fade after the fish is taken out of the water.

WRAXALL, SIR FREDERICK CHARLES LASCELLES, 1828-65; b. Boulogne; educated at Oxford. He served as assistant commissary in the Crimean war, and published *Camp Life* (1860). Others of his books are: *Handbook to the Armies of Europe*; *Armies of the Great Powers*; *Military Sketches*; *Memoirs of Queen Hortense*; and several novels. Sir Frederick was grandson of Sir NATHANIEL WILLIAM, 1751-1831, a traveler and author who wrote several books of a historical and biographical character, such as *Historical Memoirs of my own Time* (1836).

WREATH, WREATHED, in heraldry. A wreath is a twisted garland of silk of different colors, otherwise called a torse, on which it has, since the 14th c., been usual to place the crest. The side-view of a wreath thus dawn exhibits six divisions, which are generally finctured with the livery colors—that is, the principal metal and color of the shield. Every crest is now understood to be placed upon a wreath, except when it is expressly stated to issue out of a chapeau or coronet. A wreath, when represented alone, shows its circular form. A Moor's head is sometimes encircled with a heraldic wreath. A wreath is always understood to be the twisted garland of silk above explained, unless otherwise specified; but wreaths of laurel, oak, ivy, etc., sometimes occur, and savages used as supporters are often wreathed about the head and middle with laurel. Ordinaries are occasionally *wreathed*, otherwise called *tortillé*, in which case they are represented as if composed of two colors, twisted as in the heraldic wreath; as in the coat of Carmichael, argent, a fess wreathed azure and gules.

WRECK, in maritime law, all goods cast upon land by the sea, and so left as to belong not to the jurisdiction of admiralty, but of the common law. By an ancient English statute, long since repealed, if any, either man or animal, escaped alive, there was, legally speaking, no wreck. Wreck belonged to the crown, but the rule is now, both in England and the United States, that it may be claimed by the owner within a year and a day, and afterward may be sold and the proceeds held by the government. For the compensation paid sailors, see SALVAGE (*ante*).

WREDE, KARL PHILIPP, Prince of, a Bavarian field-marshal, was born at Heidelberg, April 29, 1767. Belonging to a noble family, he early obtained official employment, and in 1792 was assessor to the high court of Heidelberg; in 1793, was elected "civil commissary" in the palatinate, and in this latter capacity accompanied for five years the armies of Wurmser, duke Albert, and the archduke Charles, in Italy and Germany; and frequently took a direct share in military operations. In 1799 his military career may be said to have commenced by his leading a body of Bavarian volunteers to join the archduke Charles, and for his distinguished conduct in that campaign he obtained, May 15, 1800, the grade of maj.gen. After the peace of 1800, he devoted much time and labor to the organization of the Bavarian army; and, when war was renewed, found himself at the head of the Bavarian contingent, well disciplined and thoroughly equipped, fighting side by side with his former foes the French, and took a prominent part in most of the campaigns against the Austrians, Prussians, and Russians till 1813. But after the retreat from Russia, offended at some real or fancied insults which had been offered to him, he returned to Munich, joined the anti-French party, which was headed by the queen and crown-prince; and, though his intrigues were put a stop to by the victories of Lützen and Bautzen, he soon after succeeded in bringing about the treaty of Oct. 8, 1813, by which Bavaria joined the coalition against France, and, before the end of the same month, was at the head of 70,000 men. Attacked by Napoleon with an inferior force, he was, after a bloody and protracted contest, defeated at Hanau. He was chosen soon after to command the fourth corps of Schwarzenberg's army, and though unsuccessful in most of his petty conflicts, contributed considerably to the successful advance on Paris. His services were rewarded by the dignities of field-marshal (March 7) and prince (June 9, 1814), and by the gift of the domain of Ellingen. On the brief renewal of the contest during the "hundred days," Wrede was preparing to invade Lorraine, when the battle of Waterloo put an end to the strife. After this period, Wrede was employed on many important missions,

and was charged with the pacification of Rhenish Bavaria during the revolution of 1830. He died at Ellingen, Dec. 12, 1838.

WREN, Sir CHRISTOPHER, a renowned English architect, was born at East Knoyle, in Wiltshire, on Oct. 20, 1632. His father, Dr. C. Wren, was dean of Windsor, and his uncle, Dr. M. Wren, was bishop successively of Hereford, Norwich, and Ely. At an early age, young Wren was placed at Westminster school, under the celebrated Dr. Busby, and while yet only in his fourteenth year, was entered a gentleman-commoner of Wadham college, Oxford. Here he made considerable progress in mathematical studies, and attracted the notice of the cultivators of physical science—whether resident at the university or visitors—by his inventions of certain mathematical instruments, and his general zeal, and enthusiasm in the pursuit of experimental philosophy. In 1650 he took his degree of B.A., and in 1653, that of M.A., having been previously made fellow of All Souls. He now also became a member of a society established at Oxford for the improvement of natural and experimental philosophy; and in 1654 is spoken of by Evelyn, in his *Diary*, as “that miracle of a youth;” also, in his *Sculptura*, as “that rare and early prodigy of universal science.” The acquaintance thus begun, ripened into a firm friendship between Wren and Evelyn.

In 1655 Wren greatly assisted in perfecting the barometer, then only recently invented. In 1657 he left Oxford for London, where he became Gresham professor of astronomy. In May, 1661, however, he returned to Oxford, as Savilian professor of astronomy. The same year he received the degree of D.C.L. Before leaving London, Wren had in conjunction with lord Brouncker, the hon. Robert Boyle, Mr. Bruce, Dr. Wilkins, sir Robert Moray, and others, who used to meet together at Gresham college, laid the foundation of the future royal society. Before the society was formally incorporated, the members felt much the absence of Wren from their meetings, and one of their first proceedings was to get the king to lay his commands upon him to perfect a design he had in hand of a globe of the moon, and to “proceed in drawing the shapes of little animals as they appear in the microscope.” The lunar globe was finished, much to the satisfaction of his majesty, who placed it in his cabinet of rarities. He also summoned Wren from Oxford to assist sir John Denham with his advice on architectural subjects; the poet Denham having been appointed surveyor-general of his majesty’s buildings, but possessing little or no knowledge of the subject.

The study of architecture was one to which Wren had given great attention, while still a very young man, notwithstanding his devotion to mathematics, astronomy, chemistry, and even anatomy. In 1663, in his capacity of assistant surveyor-general, he was offered a large salary to go to Tangier, to survey and direct the works at the mole, harbor, and fortifications; but this commission he declined. In the same year Wren was engaged by the dean and chapter of St. Paul’s to make a survey of the cathedral, with a view to certain projected repairs in that vast fabric. He accordingly drew up a very careful and elaborate account of the state of the building, with suggestions for its improvement and accompanying drawings and designs. All of these were laid before the king; but before any further steps were taken for the restoration of St. Paul’s, that building was leveled to the ground by the memorable fire of 1666, and Wren was destined to be the architect of the new cathedral, instead of the restorer of the old. The first work actually built from a design by Wren was the chapel at Pembroke college, Cambridge, in 1663. But in the same year he designed the Sheldonian theater at Oxford, which was commenced in 1664, and finished in 1669. In 1664 Wren also designed some valuable additions to the buildings at Trinity college, Cambridge; particularly the beautiful western quadrangle known as Neville’s court. To this he added, in 1666, the library of Trinity college, said by Gwilt to be “one of his finest productions, and one with which he himself was well satisfied. It consists of two orders; a Doric arcade below, open to a basement supported by columns, which has a flat ceiling. . . . The principal story is decorated with three quarter columns of the Ionic order, well proportioned.”

In 1665 Wren visited Paris, where he made the acquaintance of Bernini, architect of the Louvre, and of other distinguished men. In the following year he returned to find the royal society earnestly engaged in searching out the causes of the great plague, so soon to be succeeded by the great fire which laid London in ashes. This disaster at once opened a wide field for the exertion of Wren’s genius. He formed a plan, and drew designs for the entire rebuilding of the metropolis, embracing wide streets, magnificent quays along the banks of the river, and other well-considered improvements. In rebuilding London, however, few of Wren’s recommendations were adopted. He was certainly chosen to be the architect of new St. Paul’s, one of the finest non-Gothic cathedrals in the world; besides which, he designed more than 50 other churches in place of those destroyed by the fire. The great church of St. Paul, built on the model of St. Peter’s at Rome, was begun in 1675, and completed in 1710, when the last stone was laid upon the lantern by the architect’s son, Christopher. Besides the numerous churches mentioned, Wren built the royal exchange, London, in 1667; custom-house, London, in 1668; Temple Bar in 1670; the monument, in 1671–77; the college of physicians in 1674–98; the royal observatory, Greenwich, in 1675; the gateway tower, Christ church, Oxford, in 1681–82; Chelsea hospital, 1682–90; Ashmolean museum,

Oxford, 1683; Hampton court, 1690; Morden college, Blackheath, 1692; Greenwich hospital, 1696; Buckingham house, 1703; Marlborough house, 1709; the towers at the w. front of Westminster abbey in 1713; besides the unfinished palace of Winchester, in 1683.

In 1672 Wren received the honor of knighthood. In 1674 he married Faith, daughter of sir John Coghill, by whom he had a son, Christopher, who survived him; and his wife dying, he married, in 1679, Jane, daughter of viscount Fitzwilliam, by whom he had issue, a son and daughter. In 1680, Wren was elected president of the royal society. In 1684 he was made controller of the works at Windsor castle; and in 1685 he was elected grand master of the order of freemasons. He was also elected a member of the house of commons for New Windsor in 1689, and being unseated on petition, was immediately re-elected for the same place. In 1698 he was appointed surveyor-general of the works and repairs at the abbey of St. Peter, Westminster; and in the same year, was again elected grand master of the freemasons. Wren died in his chair after dinner, Feb. 25, 1723, aged 90 years, and was buried in St. Paul's cathedral, where the appropriate inscription of "*St monumentum requiris, circumspice,*" marks his tomb. During his declining years, he was treated with neglect, and even injustice, by the court of England; "one Benson" was appointed by George I. to supersede him in the office of surveyor-general; and some private individuals carped at his works in a most malevolent spirit. Steele, however, vindicated the fame of his friend in the *Tatler*, in which Wren is introduced in the character of Nestor; and few have been found since that time hardy enough to call in question the well-merited reputation of sir Christopher Wren as a distinguished architect, mathematician, and scientific observer.

WREN. *Troglodytes*, a genus of birds of the creeper family *certhiade*, having a slender, slightly curved, and pointed bill, the edge of the mandibles entire; the wings very short and rounded; the tail short, and carried erect; the legs slender, and rather long. Their plumage is generally dull. They are natives chiefly of the northern hemisphere, and most of them are American. They live on or near the ground, seeking for insects and worms among low bushes, and in other similar situations. The COMMON or EUROPEAN WREN (*T. vulgaris*) is found in all parts of Europe, and in the n. of Asia. It is more abundant in the northern than in the central and southern parts of Europe, and is found even in the Arctic regions. It is a very small bird, only about 4 in. long, reddish-brown above, with narrow transverse streaks of dark brown, yellowish-white below, the greater wing-coverts with three or four small head-like spots of white. From its peculiarity of form, and its active, lively habits, it is one of the most familiarly known of British birds. It frequents gardens, hedges, and thickets. Its flight is not long sustained; it merely flits from bush to bush, or from one stone to another, with very rapid motion of the wings. It sometimes ascends trees, nearly in the manner of creepers. The male has a loud sweet song. The nest is large for the size of the bird, oval, domed above, with an opening on the side, and is composed of hay or moss, lined with feathers, and generally of materials such that it resembles in color the objects beside it, and is not easily discovered. It is often placed under the thatch of a building, under the turf of a turf-topped wall, against the side of a moss-covered tree, or under an impending bank, always so as to be sheltered from rain. The eggs are usually from 7 to 10 in number, and the male is assiduous in his attentions to the female in supplying her with food during incubation, and afterward assists her in the care of the young. Two broods are produced in the season. In severe winter weather, a number of wrens often take shelter together in an old nest or in a hole of a wall; sometimes they roost in byres, to enjoy the warmth proceeding from the cattle. When driven from bushes, the wren is easily run down; and the hunting of wrens on St. Stephen's day is an old custom in the s. of Ireland. In general, however, the wren is almost as much a popular favorite in Britain as the redbreast. The name *Kitty Wren* is popularly given to it in many parts of the country.—The North American species of wren are numerous; some of them, however, have recently been placed in new genera.—The HOUSE WREN (*T. arizon*) is larger than the European wren, being about 5 in. long. It is reddish-brown above, barred with dusky, and pale fulvous white below, with a light brownish tinge across the breast. It is abundant in the eastern parts of the United States. It is less shy than the European wren, and often builds its nest near houses, and in boxes prepared for it. The nests are made to fill the boxes; and to effect this, a large mass of heterogeneous materials is sometimes collected. The song of the house wren is very sweet. The male is a very bold, pugnacious bird, readily attacking birds far larger than itself, as the blue-bird and swallows, and taking possession of the boxes which they have appropriated for their nests. It even attacks cats when they approach its nest.—The WINTER WREN (*T. hyemalis*), is so similar to the European wren, that it is not easy to state a specific difference. It is common throughout North America, from Labrador to Louisiana, and partially migratory. Several other species are common in North America, as the CAROLINA WREN (*Troglodytes* or *thryophilus ludovicianus*) and the MARSH WREN (*Troglodytes* or *cistophilus palustris*), both of which are found chiefly in the vicinity of water. All of them agree very nearly in their habits with the common wren.

WREX'HAM, a municipal and parliamentary borough in Denbighshire, and one of the most important towns in North Wales, 11 m. s.s.w. of Chester, on an affluent of the Dee. The town is handsome and lively, and the church, a handsome edifice in perpendicular, was built about the year 1470, though its tower, 135 ft. in height, was not completed till 1500. This church contains a monument and two medallions by Roubilliac. In the vicinity are several collieries, which, together with lead-mines, iron-works, paper-mills, and breweries, give employment to the inhabitants. It is also of very considerable importance on account of its markets and fairs, one of which, in March, lasts for 14 days, and is attended by traders of all descriptions, and from great distances. Wrexham unites with Denbigh, Holt, and Ruthin in sending a member to parliament. It is a station on the Chester and Shrewsbury railway. Pop. '61, 7,562; '71, 8,576.

WRIGHT, a co. in central Iowa; 576 sq.m.; pop. '80, 5,062—4,282 of American birth. Co. seat, Clarion.

WRIGHT, a co. in central Minn., bounded on the n.e. by the Mississippi river, and on the s.e. by the Crow river; about 675 sq.m.; pop. '80, 18,104—11,995 of American birth. Co. seat, Buffalo.

WRIGHT, a co. in s. Mo.; about 640 sq.m.; pop. '80, 9,733—9,559 of American birth, 262 colored. Copper and lead are found. Co. seat, Hartville.

WRIGHT, ASHER, 1803-75; b. N. H.; graduated at Dartmouth college, 1823, and Andover theological seminary, 1831; was a missionary of the American board to the Seneca Indians upon the Buffalo creek and Cattaraugus reservations, 1831-75. He translated parts of the New Testament into the Seneca language, prepared school books and a hymn book.

WRIGHT, ELIZUR, b. Conn., 1804; graduated at Yale in 1826. He was professor of mathematics and natural philosophy at Western Reserve college, 1829-33, when he settled in New York, where he was for 5 years secretary of the anti-slavery society, editing within that time 2 anti-slavery periodicals, *Human Rights* and the *Quarterly Anti-Slavery Magazine*. He went to Boston, 1838, and edited the *Massachusetts Abolitionist*, the *Chronotype*, and its successor, the *Commonwealth*. He was state insurance commissioner of Massachusetts, 1858-66. He has taken an active part in the discussions on life insurance. He published a translation of La Fontaine's *Fables* in 1841. He is a prominent member of the liberal league.

WRIGHT, FANNY. See D'ARUSMONT, FRANCES.

WRIGHT, HENRY C., 1797-1876; b. R. I. He was one of the most radical agitators in the anti-slavery movement, and lectured on that subject and on socialism and spiritualism. He wrote on physiology and on universal peace, and was the author of *The Living Present and the Dead Past*.

WRIGHT, HORATIO GATES, b. Conn., 1820; graduated at West Point, and was appointed to the engineers. He was assistant professor of engineering at West Point, 1842-44, and was commissioned maj. in 1861. At the first battle of Bull Run he was Heintzelman's chief engineer; commanded the 2d brigade in the expedition to Port Royal, and was head of the expedition to which Fernandina, Fla., surrendered in 1862. The next year he led a division of the army of the Potomac at Gettysburg. He commanded the 6th corps during the Richmond campaign; went through the Shenandoah campaign, and was wounded at Spottsylvania and Cedar creek. He served through the war, attaining the rank of maj.gen.

WRIGHT, JOSEPH, 1756-93; b. N. J. In 1772 he went to England; studied art there and had some success as a portrait painter. Among his sitters was the prince of Wales. After his return to this country he painted three portraits of Washington, was the designer of the first national coins, and the first draughtsman of the U. S. mint.

WRIGHT, SILAS, 1795-1847; b. Mass.; educated at Middlebury college, and called to the bar. He began practice in Canton, N. Y., in 1819. The next year he was elected surrogate, and in 1823 he became a democratic member of the state senate, where he opposed the policy of DeWitt Clinton. He sat in congress, 1827-29, and approved the protective tariff of 1828, though at a later period he favored a tariff for revenue only. A motion to appoint a committee to investigate the expediency of abolishing slavery in the District of Columbia received his vote. He was comptroller of New York, 1829-33, when he was elected to the U. S. senate, where he remained till 1844, when he was elected governor of New York. During his service in the senate he supported Henry Clay's compromise bill, and Jackson's removal of the deposits from the U. S. bank, the re-charter of which he opposed. He voted against Calhoun's motion not to receive a petition for the abolition of slavery in the District of Columbia, and against the Rives resolution in 1838, denying the right of the states to meddle with slavery in the territories. He opposed the annexation of Texas, and voted for the tariff of 1842. He declined several offices from Tyler, and the secretaryship of the treasury from Polk. He failed of a re-election as governor in 1846.

WRIGHT, THOMAS, an English antiquary and historian, was b. near Ludlow, in 1810, and was educated in the grammar-school of that town. From school he proceeded to Trinity college, Cambridge, where he took his degree of B.A. in 1834, and subse-

quently that of M.A. At an early age Wright showed considerable literary talent, and while still at the university, contributed to *Fraser's Magazine*, the *Gentleman's Magazine*, the *Literary Gazette*, and other periodicals. In 1836 he came to London, and at once commenced the career of a man of letters; and from that time till his death he was continually before the public in the capacity of author, editor, or translator. In 1837 he was elected a fellow of the society of antiquaries; and in the following year published his first considerable work, entitled *Queen Elizabeth and her Times* (2 vols. 8vo). In this year also he was one of the two founders of the Camden society, for which he edited various works at different times, such as the *Latin Poems of Walter Mapes*, *Letters on the Dissolution of the Monasteries*, etc. He was also for some years honorary secretary of the Camden society. In 1843 Wright, in conjunction with his friend, Mr. Roach Smith, founded the British archaeological association. He also took an active part in the formation of the Percy and Shakespeare societies, and for each of these, from time to time, edited volumes. Upon the death of the earl of Munster, in 1842, Wright was elected to succeed him as corresponding member of the institute of France, an honor never before attained by one so young. There were several candidates; but Wright was chosen by a large majority, among whom were two ministers of state, MM. Guizot and Villemain. Wright was also a member of the society of antiquaries of France, of the ethnological society of Paris, of the Royal society of northern antiquaries of Copenhagen, and of other learned societies on the continent and in America.

Of Wright's various works—said to exceed 100 volumes in number, including, of course, translations and works edited for societies—the following may be regarded as the principal: *Biographia Britannica Literaria*, 2 vols., of which the Anglo-Saxon period appeared in 1842, and the Anglo-Norman in 1846; *Essays on Subjects connected with the Literature, Popular Superstitions, and History of England in the Middle Ages* (2 vols. 1845); *The Archaeological Album, or Museum of National Antiquities, the Illustrations by F. W. Fairholt* (1845); *England under the House of Hanover, Illustrated from the Caricatures of the Day* (2 vols., 1848); *Narratives of Sorcery and Magic* (2 vols. 1851); *History of Ludlow* (1852); *The Celt, the Roman, and the Saxon: a History of the Early Inhabitants of Britain down to the Conversion of the Anglo-Saxons to Christianity* (1852; 2d ed. 1861); *History of Ireland* (3 vols. 1854); *Wanderings of an Antiquary* (1854); *Cambridge University Transactions* (2 vols. 1854); *Dictionary of Obsolete and Provincial English* (2 vols. 1857); *History of France* (3 vols. 1856–1863); *Guide to the Ruins of the Roman City of Uriconium, at Wroreter, near Shrewsbury* (1859); *Political Poems and Songs relating to English History, composed during the Period from the Accession of Edward III. to that of Richard III.* (2 vols. 1859–61). These volumes form part of the series of works published, under the direction of the master of the rolls, in illustration of the mediæval history of England; *Les Cent Nouvelles Nouvelles* (2 vols. 1858), being a collection of mediæval tales from the only known manuscript of the same, discovered by Wright in the library of the Hunterian museum, Glasgow; *Essays on Archaeological Subjects* (2 vols. 1861); *History of Domestic Manners and Sentiments in England during the Middle Ages, with Illustrations by F. W. Fairholt* (1861); *A History of Caricature and Grotesque in Literature and Art, with Illustrations by F. W. Fairholt* (1865). To these may be added his *Womankind in Western Europe* (1869); *Uriconium: a Historical Account of the Ancient Roman City* (1872); and his translations of Pauli's *King Alfred*, and of Napoleon's *Julius Cæsar*. He died Dec. 23, 1877.

WRIGHT, WILLIAM, PH.D., LL.D., b. Bengal, India, 1830; educated at St. Andrew's and Halle universities; became deeply learned in the oriental languages, and was made professor of Arabic in University college, London, 1855; in Trinity college, Dublin, 1856; and in Cambridge, 1870. From 1860 to 1870 he was employed as assistant in the manuscript department of the British museum. He received the degree of LL.D. from Cambridge, Dublin, Edinburgh, and St. Andrew's, and PH.D. from Leyden. He has published several translations from the Arabic and Syriac; among others the *Apocryphal Acts of the Apostles*, and the *Book of Jonah in four Oriental Versions*; also, a grammar and text-books of the Arabic.

WRIGHT, WILLIAM ALDIS, b. England, 1836; educated at Cambridge, and became librarian of Trinity college. He contributed many articles to Smith's *Dictionary of the Bible*, and has edited Bacon's *Essays*, *The Bible Word-Book*, Chaucer's *Clerke's Tale*, and Robert of Gloucester's *Metrical Chronicle*. He was also coeditor with W. G. Clark of the Cambridge, and Globe editions of Shakespeare.

WRIGHTIA, a genus of plants of the natural order *apocynaceæ*, containing some of the greatest twining shrubs of the East Indies, such as, attaching themselves in the first instance to trees for support, become themselves at last of tree-like thickness, as well as height, and kill the supporting trees by their choking embrace. The corolla is salver-shaped, with scales in its throat; the fruit consists of two erect follicles. The leaves are simple, generally ovate, or nearly so. The timber of some species, as *W. mollissima* and *W. coccinea*, is valuable. *W. antidysenterica*, a native of Ceylon, yields CONESSI BARK, a valuable astringent and febrifuge; *W. tinctoria*, common in many parts of India, yields excellent indigo, and was strongly recommended for cultivation on this account by Dr. Roxburgh, the produce being large, and the plant less dependent on rain than the species of *indigofera*.

WRIT is a general term much used in the law to denote a formal document proceeding in the queen's name, or the name of a judge or other officer of the law. Such is a writ of summons commencing an action at law. In nearly all actions and proceedings, writs of various kinds are issued, which are named from the nature of the particular act to be done.

WRIT (*ante*) is issued by a court or some other competent authority, sealed and signed by the clerk of the court or other proper officer, and directed to the sheriff or other person authorized to execute it. It may issue at the beginning of or during an action. Writs are *original*, beginning proceedings; or of *mesne process*, during proceedings; or of *execution*, making operative the judgment of the court. Many of the old common-law writs have been abolished. Most important are the writs of *habeas corpus*, of *certiorari*, and of *error*.

WRITER, a term vaguely applied in Scotland to a law practitioner or his clerk; in provincial towns more definitely to a law agent practicing before the sheriff, and acting as factor in the management of private affairs.

WRITER TO THE SIGNET, or **CLERK TO THE SIGNET**, the name of an important body of legal practitioners in Edinburgh, who derive this designation from having been originally clerks in the office of the secretary of state, where the different writs that passed under the king's signet were prepared. Act 1537, c. 39, establishing the college of justice, mentions the clerks to the signet as a previously existing body; and though no charter of incorporation is extant, the society is considered entitled to all the privileges of a corporation. The keeper of the signet, an officer appointed by the crown, appoints one of the members of the society of writers to the signet his deputy, who is in use to preside at meetings of the society, and along with certain other members named by him as commissioners to manage its affairs. Admission to the society must be preceded (1) by attendance during two different sessions, or two full winter courses of lectures on the faculty of arts of a Scottish university; (2) by a five years' apprenticeship; (3) by attendance on four courses of law in the university. Previous to admission the candidate is examined in scholarship and in law. The whole expense of admission to the society, including the apprentice fee of £200, is £410, 15s. 6d. The writers to the signet have long been the principal body of law agents practicing before the supreme courts of Scotland; and the individual members of the body are also entitled to practice before the sheriff court in all matters which have been transferred by statute from the supreme courts to the sheriff court, as proceedings in bankruptcy. They possess the exclusive right of preparing the warrants of charters of land flowing from the crown, of signing summonses citing parties to appear in the court of session, and all other writs that pass the signet, as diligences for affecting the person or estate of the debtor. A very considerable proportion of the conveyancing business of Scotland is in their hands, and they are largely employed as factors in the management of private affairs. Most of them are notaries public. They possess a large and valuable library.

Act 36 and 37 Vict. c. 63 has transferred to a newly-created body, called "law agents," the exclusive right of practicing before both the supreme and the inferior courts of Scotland. Admittance to this body must be preceded by a five years' apprenticeship, which if entered on after 1873 must be under an indenture duly recorded and intimated to an officer, called the registrar of law agents, within six months from its commencement. A three years' apprenticeship is to be held sufficient in the cases of a person who has been five years clerk to a law agent, is a graduate in law or arts, an advocate in Scotland or barrister in England, or an enrolled attorney or solicitor in England. The applicant is admitted by the court of session after an examination by examiners appointed by the court. Persons who prior to Feb., 1874, were members of the society of writers to the signet, or of the society of solicitors before the supreme courts, or procurators before the inferior courts, are entitled on application to be enrolled as law agents. For three years, from Aug., 1873, the qualifications for admission are relaxed in favor of persons in course of qualifying as procurators, under the procurators act, 1865. Before being allowed to practice before the court of session or any interior court, a law agent must subscribe the roll of that court. Any law agent may on application to the court of session be admitted a notary public.

WRITERS' CRAMP, or **SCRIVENERS' PALSY**, is a peculiar kind of local spasm, in which every attempt to write instantly calls forth uncontrollable movements in the thumb, the index and middle finger, so that the pen starts up and down on the paper, and instead of a legible handwriting a mere scrawl results. "The more," says Romberg, "the patient persists in his attempt, the more the difficulty of using his pen increases; and to the visible and sensible contractions of the muscles of the thumb, contractions of the fore-arm, and even of the upper-arm, are often superadded. Abnormal sensations, especially of a sense of weight and constriction of the hand or of pain extending from the upper arm to the back, are occasionally present. It is diagnostic of these attacks that they are instantly arrested when the individual ceases writing, and that the hand is capable of every other combination of movements and exertions."—*The Nervous Diseases of Man*, vol. i, p. 320. The disease is chiefly confined to middle age, and scarcely ever occurs in women; and there can be no doubt that an occupation entailing much writing predisposes to it, the quality of the paper or of the pen having nothing to do with

it. The treatment hitherto pursued, both local and general, has, according to Romberg, been "invariably ineffectual." This is, however, too strong a term, since he mentions a case in which Stromeyer applied the principle of division of the muscles to the cure of writers' cramp, and in one case a brilliant result justified the antispasmodic reputation of tenotomy; the patient being perfectly able to write as early as the fourteenth day after the subcutaneous division of the tendon of the long flexor of the thumb." The same operation was, however, several times performed by Diffenbach without success. Mr. Solly, in his recently published *Surgical Experiences*, describes several cases of this peculiar affection, in some of which judicious treatment, combined with entire cessation of writing for a considerable time, led to satisfactory results.

WRITING is the art of fixing thoughts in a palpable and lasting shape, so as to make them known to others. There are two principles employed in this process, either separately or jointly—viz., ideographism and phonetism. An ideograph is either a picture of the object the idea of which is to be conveyed, or, at a later stage, some symbol which stands, by common consent, for the object, in which case it is called symbolism. Phonetism, on the other hand, is either syllabism—i.e., a combination of consonants and vowels which form a word, or component parts of it—or alphabetism, a system that further breaks up the syllables into their single component parts of vowels and consonants. All systems of writing seem to have originated in ideographism, and to have gradually arrived at phonetism. The pictorial mode of ideography gradually led, as indicated, to the symbolical mode. The former, also called *kyriological* (Gr. *kyrios*, principal, proper, the opposite of metaphorical or symbolical) writing, contents itself with representing only bodily things, either by fully or partly depicting them, or by merely indicating them by some special characteristic. The latter—the symbolical mode—represents abstract things in accordance with their similarity to corporeal subjects, as in the hieroglyphs of later Egyptian times. Examples of the real delineations of the subjects, or parts of them, which have been replaced by conventional signs, we find at an early period in Egypt, as well as with the Aztecs, with the primitive Assyrians, in ancient China, and in Guiana. Phonetism here no longer aims at a delineation of subjects or symbols, but of the sounds by which these objects are conveyed to the mind. The first step in phonetic writing is, as we said, the syllabic, which by degrees becomes alphabetical. Difficult though it be in many instances to fix accurately the original ideographic meaning of many of the letters now in use, there is yet absolutely no doubt as to their having once been mere pictures of certain things to which a meaning was attached, the sound of which was in some shape connected with the present value of the letter. Our knowledge of Phœnician, whence our alphabet is directly derived, and of its cognate dialects, enables us, in many instances, to trace them back to their primitive source. Thus, our *A* was originally depicted as the head of an ox, a likeness to which may still be traced in its Phœnician form, and its name (*aleph* = ox) has still survived in Hebrew and Greek (*aleph* or *alpha*). This process of the gradual change of a picture into a character is most clearly traceable in the various stages of Egyptian hieroglyphics, which, when written more cursorily, assumed such different shapes (in hieratic and demotic respectively), that often there remains scarcely a likeness between different forms of the same characters. Among the ideographic methods there are some, however, which scarcely seem to deserve the name of writing, in the ordinary sense. Such are the Peruvian quippos, or knots, which, by changes in color, size, arrangement, and the rest, indicate a certain special sequence of ideas; further, the "khernus," or sticks, which, before the introduction of their present alphabet, the Tartars used to circulate among their tribes, to indicate the number of men and horses to be used for some special expedition. Similar to the Peruvian quippos was (according to the celebrated Chinese work, *Iking*) also the primitive Chinese mode of writing; while the Scandinavian and Germanic runes rather remind of the Tartar staves. Of a more advanced stage appears the Mexican picture-writing, a system by which single syllables or words were expressed by phonograms. The Chinese system appears to combine both the ideographic and phonetic characters; but there is scarcely a doubt that even the phonetic signs are derived from ideographic ones. The step to the alphabetic system, however, was never taken by the Chinese.

When and how our present alphabet was invented has been matter of speculation from the earliest times. The myths of antiquity ascribed it to Thoth (q.v.) or to Cadmus, which only denotes their belief in its being brought from the east (Kedem), or being perhaps primeval. The Talmud ascribes it to a special revelation. It has been a question whether there were several original alphabetical systems, or whether one is to be assumed as having given rise to the various modes of writing now in use. Thus, three principal sources—Semitic, Chinese, Indian—are given by Klaproth. It is, however, now agreed on all hands that it is the Phœnician character, as we now know it, to which we directly owe our own. See PHœNICIA. From it many streams have flowed out. The principal of these appear to have been—first, the Semitic, in which the values of the letters have remained almost identical with those of the original Phœnician, with exception, perhaps, of a few sounds added to them in Persian, for the purpose of expressing certain Indo-Germanic sounds not existing in Phœnician. This class has further been subdivided into Hebrew-Samaritan and Aramaic, the latter embracing the

square or modern Hebrew, which is closely allied to the Palmyrene, the Estranghelo or Syriac, the Sabian, the Arabic in its different forms, the Mongol, the Pehlvi, Armenian, etc. The second or central division embraces the writing of Greece, Asia Minor, and Italy, from the Æolo-Doric, Etruscan, Umbrian, Oscan, and other but little known kinds, to the late Pompeian Graffiti. A further group would include the "Indo-Homeric" characters, and seems to have originated in central Arabia, whence it appears to have spread to Africa and India, where the Magadhi—the oldest variation the Phenician assumed here—gave rise to the five families of Devanaghari, Pali, Dravidian, Oceanian, and Thibetan.

Yet, when we speak of the Phenician as being the mother of all our known alphabets, we must not be understood finally to ascribe to the Phenicians the original invention of it in the first instance. We shall only indicate here that the theory to that effect, held by Gesenius and others, will probably, sooner or later, have to give way to the more recent results of De Rougé's investigations, who, with great show of probability, believes it to have been borrowed, or rather adapted from certain archaic hieroglyphics of Egypt. It would appear as if at some very archaic period the Phenicians had borrowed the hieratic signs then in use; as, indeed, the *prisse papyrus*, the oldest in existence, exhibits striking similarities with the Phenician characters. Instead, however, of simultaneously taking the Egyptian names for these characters, they invented new ones according to their own fancy, and to the supposed similarity of the characters to some particular thing. The Egyptian origin of the Phenician character, if confirmed by further researches, would be a striking instance of the correctness of the tradition to that effect, which Tacitus has preserved (*Annal.* xi. 14).

We have in the course of this work treated at full length several points of this subject. See HIEROGLYPHICS, CUNEIFORM, ALPHABET, etc. We may therefore, for a fuller elucidation of the details, refer to those articles. We shall only add in this place that the manner of writing is very different with many nations. The Mexican picture-writing begins at the bottom; the Chinese and Japanese, as well as the Mongols, write in columns beginning from the top, and going from right to left. The Egyptian hieroglyphics have no fixed direction; but the hieratic and demotic, though the single letters are formed from right to left, always run from left to right; as is also the case in Ethiopic, cuneiform, and Indo-Germanic languages generally. The Semitic languages have retained the Phenician mode of writing from right to left—all but the numerals—a mode still retained in archaic Hellenic and Etruscan. By degrees, however, the writer not wishing to return to the beginning of the line, and continuing right underneath the last word penned, a double mode was introduced, called the *boustrophedon*—as the ox plows. Finally, this too was abandoned, and the direction from left to right was followed. About the many various styles of modification our characters have undergone in the course of time, the punctuation of the words, and the rest, we refer to ALPHABET. The materials and the instruments (see PAPHYRUS, PEN, etc.) differed much at various times. Consult Steinthal, *Die Entwicklung der Schrift* (1852); Wuttke, *Geschichte der Schrift* (1872).

WRITING FLUIDS. See INK.

WRONG-DO'ER, in English law, as well as popular parlance, is he who commits some wrong for which an action may be brought to recover damages.

WRYNECK, *Yunx*, a genus of birds of the woodpecker family (*picida*), having a short, straight, conical beak; a long extensile tongue, with a horny point; wings of moderate size; a rather short and rounded tail; the feet with two toes in front, and two behind. One species, the COMMON WRYNECK (*Y. torquilla*), is a summer visitant of Britain and the n. of Europe. From its appearing at the same time with the cuckoo, it has acquired the name of *cuckoo's mate*. It is common in the s. of England, but very rare in the northern parts of Britain. It is about 7 in. long, of a rusty ash color, irregularly spotted with brown and black. It feeds on caterpillars and insects, and is often seen on the ground near ant-hills, feeding on the ants and their "eggs." The construction of its tongue resembles that of woodpeckers, and enables it to seize its insect prey with wonderful celerity; the tongue is darted out, and retracted, so that the eye can scarcely follow it; the two posterior branches of the bones of the tongue being much elongated, and muscles for its extension attached to them. There is also a long gland on each side of the lower jaw, which secretes a glutinous mucus, so that insects adhere to the horny tip of the tongue. The wryneck generally makes almost no nest, but deposits its eggs on fragments of decayed wood in the hole of a tree. The young birds are easily tamed, and are great favorites with boys. In France, it is common for boys to tie a string to one of the legs of the bird, and to allow it to climb trees in search of insects. It climbs readily on their clothes. The name wryneck is derived from the habit which the bird has of writhing its head and neck quickly in various directions, with an undulating snake-like motion, which it does particularly if found in its hole in a tree, making at the same time a hissing noise, so as to alarm the intruder; but on his drawing back, it suddenly darts out and escapes.

WUDWAN', a t. of India, in the peninsula of Kattywar, province of Guzerat, 105 m. w. by n. from Baroda. It is situated on a small river, which falls into the great salt

marsh, the Runn of Cutch. Pop. 32,220. The surrounding district is in a high state of cultivation, and is celebrated for the excellence of the cotton which it produces.

WULSTAN, or **WULFSTAN**, and sometimes **WOLSTAN**, a name of interest in connection with Anglo-Saxon history and literature. There are three individuals of the name especially noticeable.—1. A monk of Winchester in the 9th c., author of a poem, in Latin hexameters, on the Miracles of St. Swithin, which is reputed the best Latin poem of that age produced in England.—2. An archbishop of York, in 1003, author of two pastoral letters and several sermons in Anglo-Saxon, the most remarkable of which is printed in Hickes's *Thesaurus*, vol. iii.—3. The well-known bishop of Worcester, and a saint of the English calendar. He was born at Icen-tum, in Warwickshire, about 1007, and educated at Evesham and Peterborough. He became a priest, afterward a monk, and prior of the monastery of Worcester, and ultimately in 1062 bishop of that see. He lived through the troubles of the Norman conquest, and enjoyed the favor not only of the conqueror, but of William Rufus, and died in 1095, at the age of 87. He is by some reputed the author of the portion of Anglo-Saxon chronicle which extends from 1034 to the death of the conqueror.

WUPPERTHAL, a celebrated valley of Rhenish Prussia (q.v.), derives its name from the river Wupper, or Wipper, a small affluent of the Rhine, which rises between the towns of Wipperfürth and Hückeswagen, 26 m. n.e. of Cologne. Its course is first n., then n.w., past Barmen (q.v.) and Elberfeld (q.v.)—the chief town on its banks—then s.w. to its junction with the Rhine between Wiesdorf and Rhemdorf, 7 m. below Cologne, after a course of 50 miles. The waters of the Wupper are very abundant, and for the length of its course it supplies motive power to an extraordinary number (about 400) of mills, of various kinds. It is navigable for small craft below Solingen (q.v.). The valley of the Wupper is the most actively industrious and most densely peopled in all Germany. Coal is found in abundance.

WURNO, a t. of the Háusa states, central Africa, 18 m. n.e. of Sókoto, on the Sókoto, a tributary of the Niger. It is extremely filthy—the small ravine which intersects the town forming a most disgusting spectacle. Barth expresses his astonishment at the quantity of cotton brought into the market, which showed what the fine vales in the vicinity are capable of producing. The pop. is stated at from 12,000 to 13,000.

WURTEMBERG, THE KINGDOM OF, lies in 8° 15' to 10° 30' e. long., and 47° 35' to 49° 35' n. lat., is bounded on the w., s.w., and n.w. by the Grand Duchy of Baden; e., s.e., and n.e. by Bavaria; and s., for a few leagues, by the lake of Constance and Vorarlberg. Hohenzollern makes a deep indentation into the land from the s., and the entire boundary is very irregular. Detached pieces of territory belonging to Würtemberg also lie in the adjacent countries. Its greatest length, from the village of Simmringer in the n., to the lake of Constance in the s., is 139 m.; and greatest breadth, from the Katzenkopf, in the Black forest, eastward to the castle of Duffenstein in Nerestein, 105 miles. The following table gives the area and the population according to the census in 1875:

CIRCLES.	Area in Square Miles.	Population (1875).
Neckar.....	1,280	587,834
Black forest.....	1,835	454,937
Jagst.....	1,975	390,703
Danube.....	2,410	448,031
Total	7,500	1,881,505

At the census of 1871 the population was 1,818,539. Würtemberg is fourth in population of the states of the empire, after Saxony and before Baden; but is third in point of size, having a greater area than Saxony.

The capital of Würtemberg is Stuttgart (q.v.). Ulm has above 30,000 inhabitants; and Esslingen and Heilbronn have each about 20,000; but Stuttgart has no rival as to population or importance.

Physical Aspect.—The surface of Würtemberg is composed of terraces of hill and dale, the lowest point being 420 ft. above the sea. In the Black forest circle the mountains attain the highest elevation, the Hornisgrinde rising above 3,700 feet. One point of the Swabian Alps is nearly 3,000 ft. high. The valleys and plains average 500 ft. above the sea. Rich pastures, cultivated fields, orchards, gardens, hills covered with vines, and mountains with forests, give the most diversified scenery. In the s.e. are extensive peat-lands.

Rivers, Lakes, etc.—The most important rivers are: the Neckar (q.v.), with its affluent; the Danube, which receives the Iller; and the Tauber, a tributary of the Main. The Neckar and its streams drain 4,200 sq.m.; the Danube, 2,037; the rivers which fall into the lake of Constance, 714; the Tauber, 315; and other water-courses, 168 sq. miles. The only lake in the interior is the Federsee, near Buchau, in the Danube circle. There is much traffic both by steam and sailing ships on the Neckar, and from Friedrichshaven, on the lake of Constance.

Railways have been constructed to the extent of 780 English m., from Bruchsal to Ulm, Ulm to Friedrichshaven, Beitingheim to Hall, Cannstatt to the Bavarian lines, and from Plochingen by Tübingen and Rottweil into Baden and on to Schaffhausen. There were, in 1871, 445 post-offices, which forwarded 14,800,000 private letters, about 4,000,000 official letters, and near 21,000,000 newspapers. The postal income in 1875 was 4,919,400 marks, the expenditure about 200,000 marks less. Of telegraphs, there were 1500 m. in operation.

Geology, Mineralogy, etc.—The prevailing rocks are granite, gneiss, limestone, and various sandstones. Tourmaline, cobalt, bismuth, silver, malachite, chalcedony, gypsum, copper, rock-crystal, and iron occur. A great variety of fossils have been found. The peat-lands are extensive, and yield annually 450,000 florins. Fire-clay of excellent quality, earths for dyeing, and native sulphate of lime, are worked. Building materials, from the granite of the Black forest to the tufa of the Alb valley, abound. Clay-band ironstone, yielding from 30 to 36 per cent of iron, is worked in eleven different districts, and salt in five. The annual value of mineral products is about £200,000. In 1874, 10,816 tons of iron were produced, valued at £86,113. There are many springs of mineral water, those of Cannstatt and Stuttgart being much frequented.

The climate is mild and healthy, but in the highlands the winters are long and cold. When w. winds prevail, the cold of winter and summer heat are less than in some countries in the same latitude. The greatest quantity of rain falls in summer. Of the total area about 25 per cent is occupied by plains or level ground, 46 per cent is hilly, and 29 per cent mountain land. The soil is for the most part very fertile and well tilled. The vineyards are chiefly in the Neckar circle and that of the Jagst. The forests, grain, and pasture lands are nearly equally distributed throughout all the circles. Wheat, oats, barley, rye, potatoes, beans, maize, turnips, mangold-wurzel, lucerne, etc., are the principal agricultural products. There are extensive orchards in all parts of the land. Cherries, damsons, walnuts, peaches, apricots, and the more common fruits, are largely grown. Timber is largely grown and exported, especially from the Black forest regions. Large and small cattle are plentifully reared. Large cattle, which in Württemberg are generally fed in the stall, constitute the principal export of Württemberg to Switzerland and neighboring lands. Forestry and the various branches of agricultural science are diligently promoted by numerous technical institutes.

Manufactures, Industries, etc.—The manufactures are chiefly linen, woolen, cotton, and silk fabrics. Wool and cotton spinning, bleaching, dyeing, printing, iron-founding, making machinery, cutlery, gold and silver articles, glass, porcelain, earthenware, tile, cabinet-work, sawing wood, carriage-building, grinding corn, book-printing, and the cognate trades are principal industries. There are many oil-mills, beer-breweries, and brandy distilleries. Water is to a large extent the motive-power employed in the manufactories and mills. In Württemberg more than 215,500,000 bottles of beer, or 125 for each person, are consumed yearly, besides wine, brandy, and liqueurs. The total value of land, houses, railways, movables, etc., is reckoned at 2,710 million florins, and the income of the people at 276,000,000—140,000,000 being from land produce, 131,000,000 from the industries, and 5,000,000 from interest on foreign funds. The exports are chiefly grain, cattle, wood, salt, oil, leather, woolen, cotton, and linen goods, beer, etc.

Religion, Language, Education, etc.—The population of Old Württemberg is almost entirely Lutheran. The numbers of each denomination in 1871 will be seen in the subjoined table:

CIRCLES.	Evangelical Lutherans.	Roman Catholics.	Other Christians.	Jews.
The Neckar.....	497,826	44,389	2,280	4,327
" Black forest.....	339,960	116,121	746	1,328
" Jagst.....	264,479	115,752	459	4,024
" Danube.....	156,595	277,280	372	2,666
Total.....	1,248,860	553,542	3,857	12,245

Of 7,897,713 marks set apart in the budget of the year 1877-78 for "church and school," a great part was expended on the support of the various religious bodies.

Several dialects of German are spoken, of which the Swabian and Franconian are the most general. Württemberg has been the native country of many distinguished men, of whom a few may be mentioned. In poetry: Schiller, Uhland, Wieland, Kerner; in theology and philosophy: Brentz, Ecolampadius, Bengel, Schelling, Hegel, Baur, Strauss, etc.; in science and art: Kepler, Stiefel, Tobias Mayer, the botanists Joseph and Karl Friedrich Gärtner, the chemist Schönbein, the painters Eberhard Wächter, Hetch, and the famed sculptor Dannecker.

Every child between 7 and 14 years must attend school. In a district having 30 or more families is a public school, and a teacher for every 90 children. There are four Protestant theological seminaries, with a course of four years; gymnasia, grammar, trades, and high-schools in all the principal towns. The university at Tübingen has 80 ordinary and extraordinary professors and tutors. The number of students varies from

700 to 950, of whom 200 to 300 are foreigners. At Hohenheim is an agricultural and botanical institution, in which farming, management of forests, and gardening are scientifically taught. Stuttgart has a polytechnic school, which is one of the best institutions of the kind in Germany. There is not in Würtemberg a person above ten years of age who cannot both read and write.

Revenue, Expenditure, etc.—In 1877-78 the revenue was 48,338,788 marks (£2,416,940), balancing the expenditure. The interest of the national debt was 17,482,596 marks. Of the income, 21,285,293 marks came from public property (including a revenue of 13,012,000 marks from the railways), and 22,613,266 marks from direct and other taxes. For the year 1875-76 the revenue was 44,337,267 marks, which just covered the expenditure. The troops of Würtemberg form the 13th corps d'armée of the German empire.

Government, etc.—The crown is hereditary in the male line, and failing that, in the female. Freedom of the press and religion are enjoyed. The privy council consists of a president, the six ministers of state, and members named by the king. The legislative body is composed of two chambers—the first being formed of princes of the royal family, nobles, and members appointed by the king, the last named not exceeding a third part of the whole; the second chamber is composed of 13 representatives of the knighthood, 6 Protestant general superintendents, the bishop and two others of the Catholic clergy, the chancellor of the university, 7 representatives from the cities Stuttgart, Tübingen, Ludwigsburg, Ellwangen, Ulm, Heilbronn, and Reutlingen, with a representative from each of the 64 bailiwicks. Members of the second chamber are not eligible as such before reaching their 30th year. The king has the power of proroguing or dissolving the chambers; but in the latter case a new election must take place within six months. As a member of the reconstituted German empire (1871), Würtemberg has 4 votes in the federal council, and 17 representatives in the diet of the empire.

History.—The earliest inhabitants of Würtemberg were probably Celts; but when the Romans came first to know the country, it was held by the Suevi, who were succeeded by the Alemanni and the Franks. In 1090, Conrad, count of Würtemberg, possessed a castle near Cannstatt, and limited territories, which were largely added to by Ulric I. from 1246 to 1265. Other extensions were gained by Eberhard I. between 1279-1325; by Ulric II., who, though a man of peace, added Tübingen; Eberhard II., who secured Teck, Gutenberg, Kirchheim, Herrenberg, and other places. By the marriage of Eberhard IV. with the countess of Montbéliard, that county became connected with Würtemberg. At his death, the possessions were divided between his two sons, each of whom enlarged his portion; and a few years after their death, Eberhard V. secured a reunion, and the land advanced rapidly in power and importance. In 1495, the emperor Maximilian raised Eberhard to the rank of duke, with the title of Eberhard I. In 1519, duke Ulrich having offended the Swabian league by some arbitrary acts of oppression exercised upon the imperial free city of Reutlingen, he was forcibly ejected from Würtemberg, and did not reconquer his estates till 1534. While Eberhard III. was duke (1628-74), Würtemberg suffered much in consequence of the thirty years' war. Ludwig Eugene (1793-1795) having taken part in the war against the French republic, a French army attacked and compelled him to resign Montbéliard, and pay 8,000,000 francs.

With duke Frederick II., who succeeded his father in 1797, the most important period in the history of Würtemberg begins. In 1800, compelled by the French to flee from his dukedom, he got back, by the peace of Lunéville, all his territories except Montbéliard, and instead, had others granted, with the rank of elector. Having aided Napoleon in the war against Austria, at the peace of Presburg (Dec. 26, 1805), Würtemberg was further enlarged, and made a kingdom. After the battle of Leipsic, Frederick abandoned the cause of Napoleon, and concluded a treaty with Austria, in which his lands were guaranteed. His reign was arbitrary; and internal troubles were thickening around him, when he died (Oct. 30, 1816), and was succeeded by his son, William I., who was born at Lubin, in Silesia, Sept. 27, 1781. He was cordially welcomed to the throne, and the expectations of his subjects were realized. His first acts were to reduce the expenditure, and introduce other reforms, prominent among which was the liberal constitution of 1819. In 1848-50, a strong agitation was kept up with the view of obtaining some permanent modifications in this constitution, but without success. For nearly fifty years he reigned over a people steadily increasing in prosperity, and died June 25, 1864, at Rosenstein castle. His son, Charles Frederick Alexander, now Charles I., born March 6, 1823, succeeded him. See GERMANY.

WURTZ, HENRY, b. Penn., 1828; graduated at Princeton, 1848, and studied science at the Lawrence scientific school, Cambridge. In 1850 he had charge of the laboratory of the Sheffield scientific school of Yale, and has subsequently been professor of chemistry at Queens college, Canada, and the National medical college of Washington, D. C., and chemical examiner in the U. S. patent office. Prof. Wurtz has published many papers in scientific periodicals, and has made important scientific discoveries, such as the use of sodium in amalgamating the ores of precious metals.

WÜRZBURG, a former sovereign bishopric or ecclesiastical principality of the German empire, was founded in 741 (according to other accounts, 742 or 746), and received

endowments from the Frankish kings, which were afterward increased by the German emperors. The first bishop was Burkhardt, who was consecrated by Boniface. The patron saint was Kilian (q.v.), who is said to have preached the gospel here as early as 688. By good management and economy, the bishops were able to acquire numerous possessions of the neighboring Frankish proprietors; and out of these was gradually formed the extensive sovereign bishopric of Würzburg, ruled over by the prince-bishop as duke of Franconia. The ducal title and authority were first conceded about 1120. In spiritual matters, the bishops were under the archbishop of Mainz. The area of the bishopric was as much as 1827 sq.m., with a pop. of 250,000, and a yearly revenue of 500,000 guildens. At the peace of Lunéville (1801), the bishopric of Würzburg, like the other spiritual principalities of Germany, was secularized; and in 1803, the greater part of it was conferred on the elector of Bavaria as a secular principality. The last prince-bishop received a pension, and died at Bamberg in 1808. At the peace of Presburg (1805), Bavaria gave up Würzburg to the grand duke Ferdinand of Tuscany, and the principality was raised to the dignity of an electorate. In 1806, the elector Ferdinand joined the confederation of the Rhine, and from that time took the title of grand duke of Würzburg. By a decree of the Vienna congress, the grand duke received his hereditary state of Tuscany, and Würzburg reverted to Bavaria. At present the greater part of the bishopric belongs to the circle of Lower Franconia.

WÜRZBURG, capital of the former principality of Würzburg, now of the Bavarian circle of Lower Franconia, is situated in a beautiful valley on both sides of the Main, over which there is a stone bridge 600 ft. long, of 8 arches. The number of inhabitants amounts to (1875) 44,984, of whom 6,200 are Protestants. Among the public buildings, the most distinguished are the Episcopal palace or residence, rebuilt 1720-44, one of the most magnificent royal residences in the world; and the spacious and excellently fitted-up Julius hospital, established in 1576. Of the numerous churches, the most worthy of notice are the richly decorated cathedral, which was rebuilt in the 11th and following centuries; the Marien-kapelle, one of the most beautiful monuments of old German art, with 14 statues of the 15th c. by Tilmann Riemenschneider; and the Neumünster church, containing the bones of St. Kilian. The streets adjoining the palace square are wide and straight, but most of the others are narrow and crooked. In front of the Julius hospital there is a bronze statue of the founder, bishop Julius, by Wiedemann, founded in bronze by Miller; a monument of Walther von der Vogelweide (q.v.) stands in a niche outside the Neumünster kirche.

The university of Würzburg was founded in 1582 by bishop Julius, who also founded the hospital above mentioned. The endowments for both institutions were taken from the possessions of the convents that were destroyed during the peasant war (q.v.). In order to promote the study of medicine, the hospital was put in connection with the university, the professors of medicine being made physicians and surgeons to the hospital; this connection has all along kept the medical faculty in high reputation, and promoted the prosperity of the university as a whole. The present medical staff includes several names of European reputation, among others, Kölliker (q.v.). All the professors of the theological faculty are thoroughgoing Infallibilists. There is also a faculty of political economy. In the summer session 1878, there were 941 matriculated students. The library contains above 100,000 vols. In the musical institute, any one can receive instruction gratis in singing or in playing on any instrument; and twice a week there are great musical pieces performed. In Würzburg, besides the university, there is a gymnasium, a Latin school, a district agricultural and trade school, a seminary for Catholic priests, and a seminary for training teachers, an orthopedic institution, a veterinary school, a school for midwifery, a swimming school, a society for the improvement of the arts and manufactures, and a female society for the encouragement of skill in arts and handicrafts among women. Besides the Julius hospital, there are asylums for the deaf and dumb and for the blind, and other charitable institutions. The manufactures are woolen stuffs and cloth, mirror-glass, leather, tobacco, railway carriages, and sparkling wines. The fortress of Marienberg, built on the site where Drusus founded a castle, is situated on a hill 400 ft. high on the left bank of the Main, outside the town. The campaign of the Prussian army of the Main ended with an action fought before Würzburg, July 27, 1866. The fortifications have been demolished. The industry of Würzburg has greatly prospered during the last ten years.

WÜRZEN, a small walled t. of Saxony, 15½ m. e. of Leipsic, picturesquely situated and surrounded by romantic valleys, on the Mulde, here crossed by two bridges. Pop. '75, 8,165, employed in brewing, bleaching, weaving, and hosiery-work. It is a station on the Leipsic and Dresden railway.

WY'ANDOT, a co. in n.w. central Ohio; 400 sq.m.; pop. '70, 18,553—16,842 of American birth. Co. seat, Upper Sandusky.

WYANDOTS', a tribe of North American Indians, of the Iroquois family, the Hurons of the French writers, who called themselves Wendats or Yendats, first known at Montreal, where, in the middle of the 17th c., they became Roman Catholics under the instructions of the French missionaries. Having, as allies of other tribes, become involved in a war with the Iroquois, they were nearly exterminated, and the remnant emigrated to the country around lake Superior; then gathered at Mackinaw, 1670, under

the care of father Marquette; thence came to Detroit, where they furnished 400 warriors to the English in 1812. In 1829 they were settled, to the number of 600, on the headwaters of the Sandusky river in Ohio; and in 1832, by a treaty with the United States government, removed to Kansas, where the few remaining have acquired the rights of citizenship, each having of their divided lands a farm of 40 acres.

WYANDOTTE, a co. in n.e. Kansas, adjoining Missouri, and bounded on the n. by the Missouri river; 150 sq.m.; pop. 80, 19,151—16,474 of American birth. Co. seat, Wyandotte.

WYANDOTTE, a city and co. seat of Wyandotte co., Kan., on the w. bank of the Missouri river, above its junction with the Kansas, and on the Missouri Pacific railroad; pop. '80, 6,149. The Kansas river is crossed by a bridge at this point. The place has a large trade with the surrounding country. There are manufactures of plows, flour, and lumber; 3 banks, 2 weekly newspapers, and 8 churches.

WYANDOTTE, a city in Wayne co., Mich., 12 m. from Detroit, on the Detroit river; pop '80, 3,631. It is a station on the Lake Shore and Michigan and the Canada Southern railroads. There are extensive rolling-mills, blast furnaces, smelting and refining works for silver, and a ship-yard where iron steamers are built. The city was incorporated in 1867.

WYANDOTTE CAVE, in Crawford co., Ind., is over 20 m. long. Its greatest height is about 250 ft., and its greatest width about 300 feet. It is remarkable for the number and beauty of its crystals, exceeding, it is said, even the Mammoth cave in that respect. Among the remarkable features are the "pillared palace," with clusters of stalactites, "monument mountain," 175 ft. high, with 3 massive stalagmites at its top; and the "mammoth hall," 350 by 245 feet.

WYATT, RICHARD JOHN, an English sculptor of great eminence, was b. in Oxford street, London, on May 3, 1795. He belonged to a collateral branch of the family which made the name of Wyatt famous during two centuries in connection with architecture and sculpture, sharing their descent from a stock of yeomen long settled at Weeford in Staffordshire. Having the bias of his family toward art, he became an articled pupil of Charles Rossi, R.A., sculptor, and afterward a student of the Royal academy, whose medal was twice awarded to him during his pupilage. He afterward passed some time in Paris, studying under Bosio; and from Paris, in 1821, he went to Rome, and entered the studio of Canova, where he had Gibson for a fellow-pupil. The remainder of his life was spent in Rome, in complete devotion to the prosecution of his art; and he died at Rome on May 29, 1850. His youth had shown great promise in the estimation of painters like Lawrence and sculptors like Canova; and the works which he produced in rapid succession early placed him in the front rank of English sculptors. Several of his works were shown at the great exhibition of 1851, and the medal for sculpture was awarded to him, though he had died in the previous year. Living only for his art, he labored at it incessantly—often, it is said, from dawn till after midnight; and the number of his works is very great. Elegance and refinement, singularly combined with animation and finish of workmanship, are his characteristic merits, but his works also disclose a lively and graceful invention. His favorite subjects were classical and poetical. His most admired productions are in England, and casts from several of them are to be seen at the Crystal palace. He was not admitted to the honors of the academy, a by-law of that institution confining its membership to artists resident in England.

WYATT, Sir MATHEW DIGBY, an eminent English architect and writer on art, was b. in 1820 at Rowde, near Devizes, Wilts. After his apprenticeship and studying for some time at the Royal academy, he, in 1844, went to the continent and made a diligent study of the architecture of Italy, France, and Germany. He returned to England in 1846, and in 1848 published *Geometrical Mosaics of the Middle Ages*. He not only studied decorative art in his own profession, but also in its various applications. In 1849 he made a report to the society of arts on the Paris exposition of industry; and soon after, as secretary to the royal commissioners, took an important part in the arrangements of the 1851 exhibition. He took a similar interest in the Sydenham Crystal palace. In 1856 he was appointed architect to the East India company, for whom he designed several important public works—bridges, barracks, and hospitals. In 1865 he was made honorary member of several foreign academies, and in 1866 received the royal gold medal of the Royal institute of British architects. He was knighted in 1869, and in the same year was chosen Slade prof. of fine arts at Cambridge. His chief art publications are, *Metal Work and its Artistic Design* (1852); *Industrial Arts of the Nineteenth Century* (1853); *Art Treasures of the United Kingdom* (1857); *Fine Art* (1870); *Architect's Handbook in Spain* (1872). He died in May, 1877.

WYATT, Sir THOMAS, was born in 1503, at Allington castle in Kent. His father, sir Henry Wyatt, of a family originally of Yorkshire, stood high in favor with Henry VII.; and not less so with Henry VIII., who succeeded him. In 1515 the young Wyatt was entered at St. John's college, Cambridge, where in due time he took his degrees of bachelor and master of arts. While still very young, he was married to Elizabeth Brooks, daughter of lord Cobham. Through his father's influence, a career at court was open to him. In this sphere he was thoroughly well qualified to succeed; he was one

of the most accomplished men of his day; of a noble presence and fine manners, and withal dexterous and subtle in the management of affairs, though of unimpeached honor and integrity. In 1536 he received at the hands of the king the honor of knighthood, and the next year he was made high sheriff of Kent. Though necessarily involved in much perilous court intrigue, he continued—though once or twice in some hazard of losing it—to retain the favor of the king, and was frequently employed by him in positions of trust and importance. His chief service was rendered as English ambassador at the court of Charles V., in which capacity he acquitted himself with much diplomatic tact and skill. In 1542, in token of the king's appreciation of his services, he received a grant of lands at Lambeth; and the year after, he was named high steward of the king's manor at Maidstone. He had now very much withdrawn himself from public life, and lived for the most part retired at Allington. On Oct. 11, 1542, he died at Sherborne, of a fever contracted, it is said, on an over-hasty journey caused by a sudden summons to attend the king.

Among the other accomplishments of Wyatt was that of verse, which he seems to have begun to cultivate early, and continued through life to practice. During his life he had acquired considerable reputation as a poet; and in 1557 his poems, along with those of the celebrated Surrey, were published in London. As marking a stage in the progress of our early literature, they hold a permanent place. His love poetry is somewhat overrun with conceits derived from the study of Italian models; but some of the shorter pieces are models of grace and elegance. His satires also possess very considerable merit. More lately, in 1815, an edition of his works, in two volumes, was published in London.

WYATT, Sir THOMAS, surnamed "the younger," to distinguish him from the preceding, of whom he was the only son, was born about 1520. After a wild and riotous youth, he raised a body of men at his own expense, and did good service at the siege of Landrecies (1544), displaying considerable military talent; and continued in honorable service on the continent till 1550. In 1551, when the Spanish match was in agitation, Wyatt joined the insurrection, and led the Kentish men to Southwark, after gaining considerable successes over the royalists; but failing to capture Ludgate, he became separated from the main body of his followers, and was taken prisoner, and soon after executed, April 11, 1554.

WYCHERLEY, WILLIAM, a comic dramatist of the period of the restoration, was born at Clive, near Shrewsbury, in 1640. His father, a cavalier squire of £600 a year, sent his son to France at the age of 15; and during his residence on the banks of the Charente, the youth was a favorite at the court of the governor of Angoulême, whose accomplished wife, the Mme. Rambouillet of Voiture, converted him to the creed of the church of Rome. On his return to England in 1660 Wycherley studied a short time at Oxford, where he was reconciled to the Anglican church, and he was entered of the middle temple. His first comedy, *Love in a Wood*, was acted with great applause, and published in 1672, and it was followed by three other successful comedies, *The Gentleman Dancing-master* (1673); *The Country Wife* (1675); and *The Plain Dealer* (his best work, 1677). About 1680 the dramatist was married to a young and rich widow, the countess of Drogheda, whom he had met at Tunbridge. The lady was distractedly jealous of him, kept him from frequenting the court, which lost him the favor of the king, and watched him closely wherever he went. She did not live long, and she left him the whole of her fortune; but his succession to the estate was disputed, and an expensive lawsuit ensued, the costs of which, added to personal debts, fairly broke down the unlucky dramatist. He was committed to the Fleet, and suffered to languish there neglected for seven years. He was partly relieved by the bounty of James II.—probably because he returned to the communion of the church of Rome—and he succeeded to the patrimonial estate in Shropshire by the death of his father. This did not, however, much relieve him, as the estate was heavily mortgaged, and strictly entailed. He was on bad terms with the heir-at-law, his nephew; and on purpose to injure this relative, Wycherley, at the age of 75, married a young girl, on whom he settled a jointure; and eleven days after this transaction—the last and perhaps the most scandalous act of his life, as Macaulay describes it—the old dramatist died. His death took place in Dec., 1715, and he was interred in St. Paul's church, Covent garden. Besides his comedies, Wycherley published a volume of wretched *Miscellany Poems* (1704), and another volume, partly consisting of "moral reflections," was published after his death. The comedies of Wycherley, on which his fame rests, reflect the literary taste, the manners, and vices of the times in which he lived. They are, in truth, grossly immoral and profligate. They have, however, some literary excellence. The language is clear and forcible, the dialogues often witty and lively, some of the characters vigorously drawn, and the observations and maxims scattered throughout the different scenes are shrewd and sensible, and expressed in a terse, sententious style. Wycherley was the founder of that school of artificial comedy which Congreve, Farquhar, and Sheridan carried to its highest perfection, imparting to it an airy grace and brilliancy far above the reach of its first master.

WYCLIFFE, JOHN DE, the greatest of all the "reformers before the reformation," was born in 1324, and is supposed to have been a native of the parish of the same name, near

the town of Richmond in Yorkshire. He studied at Oxford; but of his early university career nothing is known.

Wycliffe first emerges into public notice in 1361, when his name appears as master of Balliol hall—as Balliol college was then called. In May of the same year he was instituted to the rectory of Fylingham in Lincolnshire, and shortly after resigned his mastership and went to reside at his rectory. About 1363 he took his degree, and began to read lectures on divinity at Oxford, in which his anti-Romish views were first expounded. In 1368 he exchanged the rectory of Fylingham for the living of Ludgershall, in Bucks; and in 1374 was presented to the parish of Lutterworth, of which he remained priest till his death.

In the great struggle maintained by Edward III. and his parliament against the pretensions of the papacy, regarding the exaction of certain tribute-money which had been granted by king John in acknowledgment of the fealty of the kingdom to the Roman see, Wycliffe, who had been advanced to be one of the king's chaplains, was called upon to reply to a defense of the papal claim, which had been anonymously sent abroad. This he did publicly at Oxford in an ingenious and powerful manner, and thus early showed his antipathy to the pretensions of Rome. A clear evidence of his growing reputation is furnished by his appointment in 1374, as second in a commission sent to Bruges to confer with the papal legate as to certain abuses on the part of the papacy complained of by the English parliament. It was probably on his return from this mission, that Wycliffe was promoted to a prebend in the diocese of Worcester, and at the same time presented to the rectory of Lutterworth in Leicestershire. Here he labored with great zeal, preaching not only on Sundays, but on the several festivals of the church, and showing himself "a most exemplary and unwearied pastor." Here also he began at length to speak his mind as to the papacy. The insight into papal doings which he had received at Bruges seems to have confirmed suspicions previously forming in his mind, and he is said, soon after his return to England, to have styled the pope "antichrist," "the proud worldly priest of Rome, the most cursed of clippers and purse-kervers" (cut-purses). Then began in real earnest his troubles with the hierarchy. In the beginning of 1378, he was summoned to a meeting of convocation, to be examined for his opinions. He obeyed the summons, but he appeared attended by his friend John of Gaunt and others. A great tumult ensued, the London citizens bursting into the chapel, and frightening the synod of clergy, who were ordered to sist proceedings. The papal authority was then invoked against him, and Gregory VI. issued several bulls, three addressed to the archbishop of Canterbury and other bishops, one to the king, and one to the university of Oxford, commanding an inquest into the erroneous doctrines attributed to the reformer. Wycliffe was accordingly again summoned before the prelates at Lambeth; but on this occasion also he was favored by circumstances, and escaped merely with an injunction to refrain from preaching the obnoxious doctrines.

These proceedings only served to make Wycliffe a more thorough reformer. He now entered upon his great work of translating the scriptures, and circulating them among the common people. He had a great retinue of poor preachers, who went from village to village bearing copies of parts of them. He also challenged the doctrine of transubstantiation. Many of the people, the burghers and the middle class, heard him gladly, and matters seemed tending to an open rupture with the papacy. But the times were not as yet ripe for this. Many who otherwise sympathized with the reformer were afraid of his views about transubstantiation. He was especially summoned to answer on this head, first, before a synod at the Greyfriars, London, and finally before convocation in 1382. He appeared, and defended himself with great subtlety and power. His defense was unavailing. Twenty-four "erroneous" statements were picked out of his works, which were in consequence condemned and ordered to be burned. He was banished from Oxford, but was allowed to retire to his parish of Lutterworth. His health was already shattered by hard work and many anxieties, and on the last Sunday of the year 1384, he was struck down by paralysis while conducting public worship, and two days afterward expired. Wycliffe appears to have been a man of simple faith and of earnest and manly courage. He made a strong impression upon his age; an impression there is reason to think not entirely effaced even to the time of the reformation. The Lollards, as his disciples were called, were to be found not only among the poor, but in the church, the castle, and even on the throne. Political mischances, however, overtook the party in the following century, and only a few traces of it survived here and there when the movement of the 16th c. began. See HUSS.—T. Arnold published 3 vols. of Wycliffe's select works in 1871. The *Triologus* was edited by Lechler in 1869; and *Johann von Wycliffe* in 1873, trans. (1873) by prof. Lorimer.

WYCOMBE, CHIPPING or HIGH, a municipal and parliamentary borough in Bucks, surrounded by beech-clad hills, 28 m. w.n.w. of London, on the Wye, a small affluent of the Thames. The church of All Saints is a large and handsome building, erected in 1273; it is in the Norman and early English style of architecture, and consists of a body and two aisles, and, with the chancel, is 180 ft. long. The tower is 96 ft. high, and was built in 1522. There are corn and paper mills on the Wye; beech-wood chairs are made here, and lace-making is carried on. At two miles' distance is the village of West Wycombe. Since 1867 the borough returns one member to parliament. It is connected

with the Great Western railway. Pop. '71 of municipal borough, 4,811; of parliamentary borough (which includes Chipping Wycombe township), 10,492.

WYE, a river of England, of great picturesque beauty and considerable importance, an affluent of the Severn, has its origin in two copious springs which issue from the s.e. side of Phinlimmon, not two miles from the head-water of the Severn (q.v.). It flows in a s.e. direction through Montgomeryshire and Radnorshire, forming the s.w. and s. boundary of the latter, e.s.e. to the middle of Herefordshire, and then s., dividing in its lower course the county of Monmouth from that of Gloucester, and entering the estuary of the Severn below Chepstow. Length of course, 130 m., for 70 m. of which to Hereford it is navigable for barges, though large vessels cannot ascend above Chepstow bridge. At Chepstow (q.v.) the tide rises higher than at almost any other place in Great Britain. The chief affluents of the Wye are the Lug and Ithon on the left, and the Monnow, the Caerwen, and Irfron on the right. The part of the river which separates Monmouth from Gloucester is that chiefly visited for its singular beauty.

WYKEHAM, WILLIAM DE, was b. at Wickham, in Hampshire, in 1324. He was educated at Winchester. On Oct. 8, 1366, by the king's recommendation, he was elected bishop of Winchester. He was consecrated Oct. 10 of the year following. Meanwhile, he had been appointed lord high chancellor of England; in which office he was confirmed Sept. 17, 1367. He resigned on Mar. 14, 1371, on a petition being presented to the king against the government remaining too long in the hands of men connected with the church. He now devoted himself to various objects of lasting usefulness. His preparatory college or school at Winchester was opened for teaching in 1373; but the building of the college was not begun till 1387. It was finished in 1393. In the college which he instituted at Oxford, teaching had also begun in 1373; but the building of "St. Mary's college of Winchester in Oxford" was not begun till 1380; it was finished in 1393. He began the rebuilding of Winchester cathedral in 1395, and just lived to see it finished. Meanwhile, he had become the object of resentment to the duke of Lancaster and party, at whose instance he was indicted for pecuniary defalcation, and other crimes alleged to have been committed by him as keeper of the privy seal and lord chancellor. He was heard in 1376 before a commission of peers, bishops, and privy councilors, declared guilty, and a severe sentence was passed upon him. It was, however, ultimately commuted into a fine, which was remitted on the accession of Richard II. in 1377. He was one of the council of 14 appointed to the king in 1386, and in May, 1389, he was again made lord chancellor. He continued in office till Sept. 27, 1391, when he resigned; and from this date he appears to have taken little active part in public affairs. He was present in the parliament held on Sept. 30, 1399, when Richard II. was deposed. He was also present in the first parliament of Henry IV. He died at South Waltham, Sept. 27, 1404.—See *Life* by Dr. (afterward bishop) Lowth (Lond. 1754). Wykeham of Wykeham was one of the most munificent benefactors of the English church; but he was not a fanatic. He loved learning, order, civilization, and purity of manners; and as bishop of Winchester, signalized himself by his rigorous reformation of ecclesiastical abuses; but he had not the slightest tendency toward *Protestantism*, affording, in this respect, a most striking contrast to his great contemporary Wycliffe (q.v.). Wykeham of Wykeham may be taken as the type of a class of English churchmen both before and after the reformation—men who are destitute of zeal on questions of doctrine, but zealous for the dignity, culture, and practical efficiency of the church.

WYLIE, SAMUEL BROWN, D.D., 1773-1852; b. Ireland; graduated at the university of Glasgow, and removed to Philadelphia in 1797; tutor in the university of Pennsylvania, 1798; pastor of First Reformed Presbyterian church, Philadelphia, 1801-52; professor in the theological seminary of his denomination, 1809-51; conducted also a classical school with success for many years; professor of ancient languages in the university of Pennsylvania, 1828-45, and vice-provost thereof, 1838-45; and was an author of numerous works.

WYLLYS, GEORGE, 1590-1645; b. England; settled at Hartford, Conn., 1638; and was successively, assistant, deputy-governor, and governor of the colony, being elected to the last office in 1642.

WYLLYS, SAMUEL, 1739-1823; b. Conn.; graduated at Yale college in 1758. He commanded a regiment at the siege of Boston in 1775, and for the rest of the war was col. of a Connecticut regiment. He was secretary of state of Connecticut, 1795-1809. This post was occupied by members of the Wyllys family for 98 years.

WYMAN, JEFFRIES, 1814-74; b. Mass.; educated at Harvard, where he took the degree of M.D. in 1833. He was for a time demonstrator of anatomy at the Harvard medical school, and afterward curator of the Lowell institute, Boston. After studying in Europe, he was elected in 1843 professor of anatomy and physiology at Hampden-Sidney college, Richmond, Va. Four years later he became professor of anatomy at Harvard university, where he remained till his death. He at once began making collections in comparative anatomy and archaeology, and he succeeded in forming extensive and valuable collections. His rank as a comparative anatomist was high. He published nearly 70 scientific papers. He became curator of the Peabody museum of archaeology at Cambridge, Mass., on its foundation in 1866.

WYMAN, R. H., b. N. H., 1822; entered the navy, and served in the Mexican war, being present at the capture of Vera Cruz. In the civil war he commanded the *Puence* at Port Royal, and was subsequently placed at the head of the Potomac flotilla. He rose to the rank of capt., 1866, and in 1872 was made commodore. Since the war he has been in charge of the hydrographic office, Washington.

WYNTOUN, ANDREW, an old rhyming Scottish chronicler, lived in the beginning of the 15th century. Except that he was prior of the monastery of St. Serf on Loch Leven, and wrote *The Orygynale Cronykil of Scotland*, well known and valued by students of that kind of curious literature, almost no information regarding him has been preserved. Though with the usual proportion of extravagant fable, his work is not without considerable historical importance; while philologically it has very distinct value, as a specimen of the old Scotch, then as nearly as might be identical with the contemporary dialect of England. The *Orygynale Cronykil* consists of nine books or cantos, of which only the last four are devoted to Scottish history; the first five giving a fragmentary outline of the history and geography of the ancient world. From his quotations, Wyntoun seems to have been a well-read scholar for his time. His style is not essentially different from Barbour's, and his versification is the same—the pleasant octosyllabic. In 1795 a splendid edition of this work was published by Mr. D. Macpherson; and this edition has been revised and enlarged by D. Laing, LL.D. (vols. i. and ii. 1872; vol. iii. 1879).

WYOMING, a territory of the United States, formed in 1868, with an area of 97,883 sq.m., lies between 41° and 45° n. lat., and 104° and 110° w. long. Its boundaries are—n., Montana; e., Dakota and Nebraska; s., Colorado; s.w., Utah; w., Idaho. It is a very mountainous region, elevated from 2,500 to 3,000 ft. above the sea-level. The chief ranges are the Wind river range of the Rocky mountains, in the w.; the Big Horn mountains, near the center; and the Black mountains, in the n.e. The Missouri, Columbia, and Colorado have their sources within this territory; and other important rivers are the Green river in the s.w., a fork of the Platte in the s.e., and in the n.w. the Yellowstone (q.v.). The Laramie plains in the s. form a table-land of 7,000 sq.m. in extent. The soil of the valleys is moderately fertile, and there is good pasturage. Wyoming is rich in minerals, which embrace iron, copper, lead, coal, silver, and gold. The Union Pacific railway traverses the s. of Wyoming, passing Cheyenne, the chief city. Pop. '71, 9,118, besides 1800 tribal Indians: '75, estimated at 24,000.

WYOMING (*ante*) was organized as a territory in 1868 from areas previously in Dakota, Idaho, and Utah, but derived more remotely from the original territories of Nebraska, Utah, and Oregon, a portion having at one time belonged also to Washington territory. The main chain of the Rocky mountains extends across it s.e. and n.w., entering from Colorado w. of the 105th meridian, and passing out at the n.w. corner. Of these mountains, the principal ranges are the Wind river mountains in the n.w.; the Big Horn mountains, n. of the center; the Black hills in the n.e.; the Laramie mountains, s.w. of these; the Bishop mountains w. of the main chain; and the Rattlesnake hills and Sweetwater mountains, in the central portion of the territory, the former n. and the latter on both sides of the Sweetwater river. The Laramie mountains form the eastern boundary of what is known as the Laramie plains, a cold and elevated region, whose surface varies in character and elevation, some portions consisting of meadow expanses and others rolling and hilly, with very little vegetation. The most notable topographical feature of Wyoming, however, is the valley of the Yellowstone in the n.w. corner, in which an area of 3,525 sq.m. has been reserved as a national park. Here may be found the largest and most numerous geysers (or spouting, intermittent thermal springs) in the world. About 50 of them throw columns of water 200 ft. high; in all they number nearly 10,000, and they deposit chiefly lime and silica. The temperature of the calcareous springs is from 160° to 170°, that of the others rising to 200° or more. Other objects of interest are the cañons of the Yellowstone river, and the mountain ranges that hem in the valley on every side, rising here and there to 10,000 and 12,000 ft., and always covered with snow. The Yellowstone and its tributaries, the Big Horn, the Tongue, Powder, Little Missouri, and Cheyenne, drain this portion of the territory and the n. and n.e.; Green river and its tributaries traverse the s.w. section; and the n. fork of the Platte, with its tributaries, and a few of the smaller affluents of the s. fork, drain nearly all the rest. The geology of the territory embraces in the mountain ranges Devonian, carboniferous, triassic, Jurassic, and cretaceous rocks, succeeding each other in regular order; while the elevated plains are mostly cretaceous, overlaid with tertiary sands, gravel, and drift, with occasional extensive deposits of lignite or brown coal. These coal-beds contain from 50 to 54 per cent of fixed carbon, and are extensively worked. Gold is found and mined in the Sweetwater region, and also in the Black hills, and in two or three other ranges in small quantities. Extensive iron deposits are known to exist, but have not yet been developed; and there are profitable mines of copper, lead, and gypsum. The arable lands, it is believed, embrace 5,000,000 acres, and those available for grazing purposes about 35,000,000. The mountains are covered with a thick growth of pine, spruce, and hemlock trees of large size; the foot-hills have pine, spruce, aspen, walnut, elm, ash, box, elder, and red cedar; and the river-bottoms are usually abundantly supplied with two species of cottonwood and thickets of willows. The wild animals are principally the grizzly bear, black bear, wolf, prairie wolf, badger,

wolverine, otter, porcupine, mink, skunk, little ermine, buffalo, elk, deer, antelope, and prairie-dogs. The climate varies with the altitude, being severe on the higher mountains, and comparatively mild in the sheltered valleys. The average mean temperature of the year is, for the whole territory, about 44°. In the mountains it is, in some years, as low as 36°, while on the plains in the e. it averages 45°. The summers are usually cool, though sometimes the temperature for a day or two rises to 100°. The rainfall is small, varying from 8 to 13 in.; but in all the arable portions there are streams flowing at such an elevation that irrigation is not difficult.

The growth of Wyoming has been slow, as the Indians have been troublesome, and the land is not as easily cultivated as in some of the neighboring territories. Of the population in 1870, 5,605 were native and 3,513 foreign born, 7,219 were males and 1899 females. Most of the Americans were born in the territory, or in New York, Pennsylvania, and Ohio; and the foreigners were from Great Britain and Germany. The number of families was 2,248, with an average of 4.06 persons to each; of dwellings, 2,379, with an average of 3.83 to each. About 6,600 persons were engaged in occupations, of whom 165 were engaged in agriculture, 3,170 in professional and personal services, 1646 in trade and transportation, and 1660 in manufactures and mining. There were also in 1870 about 1800 Shoshone Indians in the territory, occupying a reservation of 1,520,000 acres in the western part, who maintained tribal relations. By the census of 1880 the total population was 20,788 persons, exclusive of the Indians, showing an increase in 10 years of 11,670, which is chiefly due to new discoveries of gold in the Black hills within the past few years. The territory is divided into 7 counties; and the principal settlements, all of which are small, are Cheyenne (the capital) in Laramie co.; Laramie City and Sherman, in Albany co.; Rawlins and Carbon, in Carbon co.; South Pass City, Rock Springs, Green River City, and Atlantic City, in Sweetwater co.; and Evanston, in Uintah co.: all, excepting South Pass and Atlantic Cities, on the Union Pacific railroad.

The agricultural products of the territory are small. In 1870 there were only 338 acres of land reported under cultivation, and only 4,341 acres were taken up in farms. These were valued at \$18,187, and the farm products for that year at \$42,706. The latter were chiefly 30,000 lbs. of wool and 3,180 tons of hay. The live stock on farms consisted of 584 horses, 283 mules and asses, 707 milch cows, 922 working oxen, 9,501 other cattle, 6,409 sheep, and 146 swine. That not on farms consisted of 3,169 horses and 25,342 neat cattle. The manufacturing establishments at that date numbered 32, employed 500 hands, had \$889,400 capital invested, and produced goods annually valued at \$765,424. The mining interests during the past 10 years have been steadily increasing, especially the mining of coal and the precious metals. For the year 1875 the product of the former was about 300,000 tons; and the gold yield is about \$100,000 annually. The only railroads in the territory are the Union and Central Pacific, which together traverse the southern part for 70 miles; and the Denver Pacific, extending from Cheyenne to Denver, 106 miles. The business and wealth of the territory sustain two national banks, with a joint capital of \$125,000.

The territorial finances for the years 1876-77 were reported as follows, showing that there was no debt. Cash on hand at the beginning of 1876, \$8,792.37; receipts, \$43,698.49; total, \$52,490.86; disbursements, \$50,635.34; balance, \$1855.52. The total valuation of property as assessed for the year 1877 was \$9,275,811; the rate of assessment for territorial purposes was three mills on the dollar; and the amount of tax levied for the year, \$27,837. The public educational advantages during those years were also reported to be in an encouraging condition. There were 14 school districts and 10 school-houses, and a tax of two mills on the dollar was levied at that date for their support. The number of pupils enrolled was 1220; teachers employed, 25; and the total amount paid as salaries, \$16,400. In 1870 the number of libraries was 31, with 2,603 volumes, of which 20, with 1500 volumes, were private; and there were 3 daily and 7 weekly newspapers published within the territory. In 1876 the different religious denominations were: Baptist, 2; Congregational, 1; Episcopal, 3; Methodist, 2; Presbyterian, 4; and Roman Catholic, 4.

The governor and secretary of the territory are appointed by the president of the United States, for four years usually. The legislative assembly consists of a council of 13 members and a house of representatives of 27 members, each elected for two years. The judicial power is vested in a supreme court of 3 justices, appointed by the president every 4 years; 3 district courts, presided over by the judges of the supreme court; probate courts; and justices of the peace. A peculiarity in the social and political character of the territory is the existence of woman-suffrage. Women also sit upon juries, and are eligible to public offices. The territory is entitled to one delegate to congress.

WYOMING, a co. in w. New York, bounded on the s.e. by the Genesee river; 575 sq.m.; pop. '80, 30,097—27,008 of American birth. Co. seat, Warsaw.

WYOMING, a co. in n.e. Pennsylvania; about 380 sq.m.; pop. '80, 15,598—15,020 of American birth. Coal and iron are found. Co. seat, Tunkhannock.

WYOMING, a co. in s. West Virginia, adjoining Virginia on the s.w.; about 500 sq.m.; pop. '80, 4,322—4,318 of American birth, 64 colored. Co. seat, Oceana.

WYOMING VALLEY, a beautiful fertile valley on the Susquehanna river, in Pennsylvania, 21. m. long by 3 wide, surrounded by mountains 1000 ft. high, its name

supposed to be a corruption of the Indian *Maughwauwame*—large plains. It was purchased about 1765 by a Connecticut company from the Delaware Indians; but the settlers were soon dispersed by hostile savages. In 1769, 40 families came from Connecticut, but found a party of Pennsylvanians in possession, and for several years there were continual contests of the settlers with the Indians, and with each other. The Connecticut colony finally succeeded, and their town of Westmoreland had 2,000 inhabitants. In 1776 they armed for their own defense against the English and their Indian allies; but in 1778, most of their troops were called to join the army under Washington. June 30, a force of 400 British provincials, or Tories, and 700 Seneca Indians, led by col. John Butler, entered the valley, and were opposed by 300 men, under col. Zebulon Butler. On July 3, the settlers were driven to the shelter of fort Forty, with the loss of two-thirds of their number, many soldiers and inhabitants being murdered; a half-breed Indian woman, called queen Esther, having, in revenge for her son's death, tomahawked fourteen with her own hand. On the 5th, the remnant of the troops surrendered, and they and the inhabitants were either massacred or driven from the valley, which was left a smoking solitude. Campbell's *Gertrude of Wyoming*, founded upon the stories of this disaster, contains exaggerations and misstatements, notably that of attributing the leadership to Brandt, who was not in the expedition. The disputes between the Connecticut and Pennsylvanian settlers were not finally settled till the commencement of this century. The valley is now one of the most flourishing districts in the state.

WYTHE (pronounced With), a co. in s.w. Virginia, about 525 sq.m.; pop. '80, 14,318—14,166 of American birth, 2,853 colored. Iron and coal are found. Co. seat, Wytheville.

WYTHE, GEORGE, 1726-1806; b. Va.; educated at William and Mary college. He came into the possession of a large fortune by the death of his parents during his minority, and fell into dissipated habits; but when about 30 years of age, changed his course, and began to study law. He was admitted to the bar in 1757, and soon rose to eminence. He represented William and Mary college in the house of burgesses for several years, and in 1764 framed a remonstrance against the stamp act. In 1776 he was a commissioner with Jefferson and others to revise the Virginia statutes. He was a delegate to congress, 1775-77, when he was elected speaker of the house of delegates, and appointed judge of the high court of chancery; and in 1786 he was made chancellor, an office which he held for about 20 years. He was law professor at William and Mary college, 1779-89, and a member of the Virginia convention which ratified the federal constitution in 1788. He died by poison. He emancipated his slaves. He published *Decisions by the High Court of Chancery* (1795).

WYTENBACH, DANIEL. 1746-1820; b. Bern, Switzerland; educated at the universities of Marburg, Göttingen, and Leyden. He became professor of Greek and of philosophy at Amsterdam, 1771; and in 1779 was made professor of elocution at Leyden. He edited Plato's *Phædo*, and the *Moralia*, and *Animadversions of Plutarch*, and published a number of philosophical and critical works in the Latin language.

WYVERN, a fictitious monster of the middle ages, frequently occurring in heraldry. It resembles a dragon, but has only two legs and feet, which are like those of the eagle.

X.

X, THE last letter of the proper Latin alphabet, and the last but two of the English. It is in reality a superfluous character, being equivalent in English, as it was in Latin, to *ks* or *gs*. In form, it corresponds to the Greek χ , but in power to Greek ξ . It was a later addition to the Latin alphabet, having been introduced, according to Corssen, between the time of the decemvirate and the fall of Veii. Some Roman scholars did not acknowledge the character, but wrote *cs*, *gs* instead; and this substitution frequently occurs in inscriptions (e.g., *ucsr̄i*, for *ur̄ori*). At one period of Roman literature, *x* was often written for *x*; e.g., *sarsum*, *lars*. In the popular pronunciation, the guttural element of the character gradually disappeared, until, in the later period of the empire, *x* was undistinguishable from *ss* or *s*; thus, inscriptions show *visit* for *virit*, *mīlex* for *mīes*. This change survives in modern Italian, which substitutes *ss* or *s* for the Latin *x*, as *sasso* = *sarum*; *stranco* = *extraneum*; and uses *x* only in foreign words. In Spanish, in the beginning of words, *x* has a guttural sound, something between *ch* and *y*. In German, the use of *x* is mostly confined to foreign words; in native words the sound is usually represented by *chs*, as *wachsen*, to wax or grow, though some write, e.g., *are* for *achse*.—In algebra, *x* is the usual symbol for the unknown quantity which is to be determined.

XANTHEINE and **XANTHINE OF FLOWERS**. The coloring matters of various flowers have been carefully examined by Fremy and Cloez, who believe that the various tints may be referred to three distinct substances, of which one is of a blue or rose color, while the other two are yellow. These pigments have received the names of *cyanine*, *xanthine*, and *xantheine*; the first being derived from the Greek *kyanos*, sky-blue; and

the last two from *xanthos*, yellow. None of these substances have, however, been extracted in a pure condition, and hence nothing definite can be stated regarding their composition or properties.

XANTHINE, or **XANTHIC OXIDE** ($C_{10}H_4N_4O_4$), was first described by Dr. Marceet, who regarded it as a very rare constituent of urinary calculi, and from its composition he gave it the name of *uric oxide*. During the last ten years it has been proved to be a normal ingredient (although to a very small amount) of human urine, and has been found in the brain, the spleen, the pancreas, and the liver of the ox; in the thymus gland of the calf; and in the muscular tissue of the horse, the ox, and of fishes; as well as in the liver of various animals. Calculi composed of this substance are extremely rare, the total known number obtained from the human subject being less than half a dozen. They are of a light-brown cinnamon color, assume a waxy appearance when rubbed, and consist of concentric layers easily separable from one another. *Xanthine* occurs in such very minute quantities in the various tissues, and is so rare an ingredient of calculi, that it is unnecessary for us to enter into any description of its properties, further than to state that, when dried, it exists as a yellowish-white powder, which assumes a glistening appearance when rubbed, and exhibits no signs of crystallization under the microscope; moreover, the chemical difficulties of detecting traces of this substance are so great that we shall not attempt to describe its tests. It seems to be intermediate to uric acid and hypoxanthine, both in a chemical and a physiological point of view. The composition of uric acid is represented by the formula $C_{10}H_4N_4O_6$, that of xanthine by $C_{10}H_4N_4O_4$, and that of hypoxanthine by $C_{10}H_4N_4O_2$. The former two occur simultaneously, not only in the urine, but in the spleen, the liver, and the brain; while xanthine is not only invariably accompanied by larger or smaller quantities of hypoxanthine, but the latter can be made by the oxidizing action of nitric acid to yield a product from which xanthine (in place of hypoxanthine) may be obtained by a process of reduction. Xanthine must be regarded as a higher stage of oxidation of hypoxanthine, and a product of the regressive metamorphosis of the tissues, which, in the ordinary condition of the system, is excreted in a more highly oxidized form of urea, uric acid, etc.

This substance is stated to have been found by Göbel in some oriental bezoars extracted from the intestines of certain ruminating animals. It is most probable that the supposed bezoars were in reality urinary calculi.

XANTHIPPE, the wife of Socrates, has acquired the reputation of having been an arch tergiteant, doubtless not without some foundation. It ought, however, to be remembered that her naturally infirm temper must have been not a little tried by the small concern manifested by Socrates in the regulation of his domestic affairs, which appears occasionally to have made it difficult for Xanthippe to "make both ends meet." Socrates himself, it is known, had completely mastered his naturally strong appetites and passions, and had acquired a temper of perfect serenity. It is quite natural, then, that contrast-lovers and story-mongers should, as a foil, match so great a practical philosopher with a woman of such an ungovernable temper as Xanthippe is said to have been. She herself, if we can trust Plato, appears to have really loved her husband, and he at his death committed her tenderly to the care of his friends. Many stories are told of her, as of every other notable character in history, to illustrate her peculiar tendency, but it is difficult to say how much credit ought to be given them.

XANTHORRHÆA. See GRASS TREE.

XANTHOXYLUM, a genus of trees and shrubs, the type of the natural order *xanthoxy-laceæ*, an order closely allied to *rutaceæ*, and chiefly distinguished from it by unisexual flowers, including more than 100 known species of trees and shrubs, having opposite simple or pinnate leaves with pellucid dots, and no stipules, chiefly natives of warm climates, and more particularly of the warm parts of America. The order is generally characterized by pungent and aromatic qualities, which are strongly developed in the genus *xanthoxylum* itself, *X. fraxineum*, a North American species, a very low, deciduous tree, with leaves somewhat like those of the ash, common from Canada to Virginia, is called **TOOTHACHE TREE**, from the use made of the hot acrid bark and capsules for the relief of toothache. It is also in high repute in the United States as a remedy for chronic rheumatism, for which it is administered in the form of a powder, in doses of from 10 grains to half a dram three times a day. Some of the species are popularly called **PEPPERS** in their native countries, as in India and Japan, where they are used as a substitute for pepper. The bark of *X. fraxineum* is a powerful sudorific and diuretic, and other species possess similar qualities; some are febrifugal, and the seeds and unripe capsules of some are gratefully aromatic.—To the order *xanthoxy-laceæ* belong the **ailanto** (q.v.) and the **WHITE IRON-WOOD** (*expris undulata*) of the cape of Good Hope, the wood of which is very hard and tough, and is much used for agricultural implements.

XANTHUS, the name of the capital of the ancient Lycia, anciently called Arina, a city of the Tramilæ, or Solymi, the primitive inhabitants. It lies at the s.w. corner of Asia Minor, and near the village of Kounik. From the earliest historic times to that of Cræsus, the Lycians appear to have been independent under native rulers; but after the fall of Sardis and the capture of Cræsus, the Persian conqueror Cyrus sent an army for

the conquest of Lycia, led by Harpagus, in 546 b.c. The most desperate resistance was made by the Lycians, and the people of Xanthus burned themselves in their citadel, rather than surrender to the conqueror, only 80 families surviving the catastrophe. Reduced to a Persian satrapy, they sent 50 ships to the expedition of Xerxes against Greece, and contributed to the revenues of Persia. Little is known of the history of this town till the days of Alexander the great. Alexander took Xanthus, which is said to have made as determined a resistance as it did on the former occasion. In the war which ensued among the successors of Alexander, Ptolemy took Xanthus from the garrison of Antigonus; and the city subsequently passed into the possession of the Ptolemies and Seleucids. After the defeat of Antiochus it was ceded by the Romans to Rhodes, but subsequently had its liberties restored. In the civil war between Brutus and the Triumvirs (43 b.c.), Xanthus was taken by Brutus. The inhabitants a third time destroyed themselves and their families, and few survived the capture. From that time Xanthus belonged to the Roman empire, and suffered in the earthquake in the reign of Tiberius; but Lycia did not lose all its freedom till the time of Claudius, who reduced it to a province. Xanthus was situated 70 stadia, or 9 m., from the sea, on the left bank of the Sibres or Sibrus, the Greek Xanthus, or Yellow river, on a plateau of elevated ground, of nearly rectangular shape, the elevated parts close to the river rising 200 feet. The most remarkable edifices in the city and its vicinity, according to ancient authors, were the Sarpedonion, or temple of Sarpedon; that of the Lycian Apollo; and Letoon, or temple of Leto. On the elevated ground, or acropolis, stood the so called Harpy Tomb, and an ancient theater of Greek workmanship; while in the other part of the city which lay to the e was a mixture of Greek and Roman buildings. The whole city and its environs contained numerous temples and tombs. The discoveries of sir C. Fellows in 1838 revealed the city of Xanthus, its temples and its monuments, and they appear to fall into the following classes: 1. The sepulchers of the early inhabitants, placed inside the wall in shape of square columns, with step-shaped bases, and sepulchral chamber on the summit. The most remarkable of these is the Harpy Tomb, so called from the subject of the bas-reliefs being the Harpies bearing off the daughters of Pandarus, king of Lycia—executed in a style resembling the earliest efforts of oriental Greek art. Another, with a frieze of lions and hunters in Persian style, and the inscribed obelisk, with long Lycian inscription and some Greek verses, apparently of the time of Artaxerxes Longimanus, and made about 466 b.c. 2. The tombs of the age of the Persian subjection, with roof-shaped tops and ridges, and imitation of wood-work, the sepulchral chamber for the principal dead being at the summit, the others in the middle and base, the sides ornamented with reliefs of a later style of art. Of a later style, but of more beautiful art, was the Ionic peristyle temple or monument of 14 columns, with a solid cella, placed on a base or pedestal, both temple and base ornamented with friezes, supposed to represent the conquest of Lycia by Harpagus, and with figures between the columns. The friezes represent hunts and feasts, the combats of Lycians and Persians, and taking of the city of Xanthus by the latter—the whole treated in a style not unlike the school of Phidias and his successors. These sculptures have been supposed to represent the exploits of Harpagus, or the suppression of the revolt of the Cilicians by a Lycian satrap, and to have been made between 450 and 387 b.c. This temple was discovered by sir C. Fellows in 1840-44.

The language found on the monuments of Lycia, written in an alphabet of 25 letters, is an Aryan dialect, distinguished by a prevalence of vowels. The letters, with two exceptions, are archaic Greek, and borrowed from by no means the oldest form of that language. The syntax and inflections are Aryan or Indo-European, but many of the roots are different from the languages of that family, although certain words may be referred to well-known equivalents—as *godu*, "lord," to the Persian; *tedecme*, "son," to the Slavonic; and *ladé*, "wife," to the Anglo-Saxon. Some words, too, resemble the Zend. The presence of many Greek words barbarously transcribed can also be well recognized in the different inscriptions, and some few derived from their Persian conquerors—as *gssatrape*, or "satrap." The inscriptions are generally short and sepulchral, and follow the well-known formula commonly used under the Roman empire, and are sometimes accompanied by Greek versions or translations, helping to explain the Lycian. One inscription alone, recording the exploits of one of the family of the Harpagi after the battle of Eurymedon (466 b.c.), on the so-called obelisk of Xanthus, is of any length. The language seems to have lasted from about the 5th c. b.c. to the 1st c. a.d.—Rawlinson, *Herodotus*, vol. i. pp. 311, 673; *Synopsis of the Contents of the British Museum*, 1855, p. 105; Fellows, *Asia Minor* (Lond. 1839); *Discoveries in Lycia* (1841); Birch in the *Archæologia*, vol. xxx. pp. 176-204.

XAVIER, ST. FRANCIS, a celebrated missionary of the Roman Catholic church, was born of a noble family at Xavier, in Navarre, April 7, 1506. Having received his early education at home, he was sent, when in his 18th year, to the college of Sainte Barbe, at Paris, where he formed the acquaintance of Ignatius de Loyola (q.v.), with whom he ultimately became associated in the foundation of the Jesuit society. Under that head will be found detailed so much of his history as regards the first establishment of the order, and the early labors of its founders in Rome. It was while he was engaged in these early labors of the society in Rome, that

Xavier attracted the notice of the representative of John III. of Portugal at Rome, Gouvea, who suggested to the king the idea of sending out members of the new order as missionaries to the Portuguese colonies in the east. Xavier was chosen for this purpose in the place of Bobadilla, who had been originally appointed, but was prevented by sickness from going on the expedition. Having sailed from Lisbon, April 7, 1541, and wintered at Mozambique, he arrived at Goa, May 6, 1542, and presented to the bishop his letters of authorization from pope Paul III. Xavier's first proceeding, on finding the excessively depraved condition of the European Christians settled in India, was to endeavor, by stirring up among them a spirit of penance and religious fervor, to remove the great obstacle to the efficacy of his preaching to the native population, which was presented by the evil example of the professing Christians of the colony. His efforts in this preliminary reformation were eminently successful, and he was equally blessed in his labors among the pearl-fishing population of the coast, from cape Comorin to the island of Manaar. After a stay of more than a year in this region he returned to Goa, and with a fresh staff of assistants visited the kingdom of Travancore, where, in the space of a single month, he baptized 10,000 natives. Passing thence to Malacca, where he was re-enforced by three other Jesuit missionaries, sent by Ignatius de Loyola in compliance with Xavier's earnest solicitations, and having achieved great success among the residents of the coast, he proceeded, in 1546, to the Banda islands, to Amboyna, and the Moluccas. In all these places his success was extraordinary. Having thus effected a first establishment of the Gospel in many places, he resolved to retrace his steps, and revisit the several scenes of his preaching. He arrived at Malacca in 1547, and thence by Manassar, near cape Comorin, where he stayed for some time, he passed to the island of Ceylon, where he converted the king of Kandy, with many of his people. In May, 1548, he returned a second time to Goa. His great object now was to carry out a project for the conversion of the Japanese empire, which had been suggested to him by a Japanese of high rank, whom he had attached to himself at Malacca, and who accompanied him to Goa. This Japanese, whom, with two of his domestics, he converted and baptized, became a most valuable auxiliary. Through his aid, Xavier was enabled during the voyage to acquire so much of the Japanese language as enabled him to translate into Japanese and explain the Apostles' creed; and although his success in the first island which he visited was very insignificant, yet at Firando, and afterward at Miako, his preaching was attended with extraordinary fruits. At the latter place he had failed signally upon his first visit, which was made in a very poor and humble guise; but having returned with a more imposing train, and under circumstances of greater outward distinction, he obtained a ready and favorable hearing, and made so lasting an impression that the mission he founded continued to flourish for above 100 years, until the final expulsion of Christianity from the Japanese empire. His mission to Japan occupied about two and a half years; and in Nov., 1551, he sailed from Amaguchi for the purpose of returning to Goa to organize a mission to China. Touching at Malacca upon his voyage, he endeavored to concert with the governor an embassy, in the name of the king of Portugal, to China, under cover of which he hoped to effect an entrance for his missionary enterprise, but on his return from Goa to Malacca, he found a new governor, who was opposed to any such attempt; and he was obliged to adopt the expedient of sailing in a merchant-ship to the island of Sancian, near Macao, which was at that time the trading depot of the Chinese with the merchants of Portugal. From Sancian, Xavier, having procured a Chinese interpreter, hoped to induce one of the native merchants to land him secretly on the coast; but in this hope also he was baffled by the fears of the Portuguese, who dreaded for themselves the vengeance of the Chinese authorities upon this infraction of the law. This disappointment, coupled with the privations and labors to which he had been exposed, brought on a violent fever, and under the combined weight of mental depression and physical sickness, this Christian hero sunk upon the very threshold of what he had looked to as the great enterprise of his life, in the island of Sancian, Dec. 22, 1552. His remains were conveyed to Malacca, and thence with great solemnity to Goa, Mar. 15, 1554. Many miracles, attested by numerous witnesses, were reported of Xavier in almost all the stages of his career. Among these there have been some who reckoned the miraculous gift of tongues. The evidence of these miracles was submitted to the usual process of inquiry at Rome; and many miracles having been established by the ordinary canonical process, Xavier was "beatified" by Paul V. in 1619, and "canonized" by Gregory XV. in 1622, his festival being fixed upon Dec. 3. His only literary remains are a collection of letters, in 5 books, 8vo (Paris, 1631), and a Catechism, with some short ascetic treatises. His *Life*, by Père Bouhours, was translated into English by Dryden. There is also a *Latin Life* by Tursellino (Rome, 1594); in Italian by Bartoli and Maffei; in German by De Vos (1877); and in English by Venn (1862) and Coleridge (1873).

XEBEC, an armed vessel of great speed, formerly used by the Algerine corsairs. It carried three masts, on which square or lateen sails could be set. The bow and stern were remarkable for the small angle they made with the water. The sides were low, and the upper deck of great convexity, that the water might readily flow off through the scuppers. As this rendered them inconvenient for walking on, gratings were laid at

the sides of the deck, to avoid the convexity. The crew walked dry on these gratings, while the water flowed out underneath. Xebecs carried from 16 to 24 guns. A few of these vessels—unarmed—still sail the Mediterranean as carriers of perishable goods.

XENIA, a handsome and flourishing t. in Ohio, and important railway junction, on the Little Miami river, 65 m. n.e. of Cincinnati, the center of a rich and populous agricultural district; it has a large court-house, jail, 3 newspapers, several churches, a college, and a theological seminary. Pop. '70, 6,337.

XENIA (*ante*), a city and co. seat of Greene co., Ohio, about 50 m. n.e. of Cincinnati, and 50 m. s.w. of Columbus, on the Pittsburg, Cincinnati, and St. Louis railroad; pop. '80, 7,026. The principal buildings are the city hall, court-house, Xenia college (Methodist), Wilberforce university (colored), a Presbyterian theological seminary, dating from 1794, and the Ohio soldiers' and sailors' orphans' home, accommodating 700 inmates. Xenia is the center of an important country trade, and there are manufactures of ropes, pumps, tools, carriages, furniture, tin and glass ware, 2 pork-packing establishments, oil-mills, and marble and granite works. There are 2 banks, 3 newspapers, a conservatory of music, 6 public schools, and 15 churches.

XENIA, in ancient Greece and Rome, the gifts given by the host to his guests. Martial calls the 13th book of his epigrams, which deals with subjects connected with this exercise of hospitality, *Xenia*. In 1797 Goethe and Schiller, borrowing this title, published in the *Musenalmanach* some 400 epigrams, in criticism of literary men and affairs. The work excited great interest at the time. Goethe's later-published *Zahme Xenien* contains criticism of a much milder character.

XENOCRATES, an ancient philosopher, was b. at Chalcedon 396 B.C., and died 314. At an early age, he attached himself to Plato, and in course of time, was so much esteemed for his proficiency in philosophy and high moral character, that he was thought worthy of succeeding Speusippus, Plato's successor, in the presidency of the academy. This post he filled most creditably for 25 years. He wrote numerous treatises upon dialectics, physics, and ethics, and drew with unusual precision the boundaries between these three departments of philosophy. Of these works merely the titles have been preserved; and what is known of his doctrines is gathered only from notices of them contained in various authors. He introduced into the academy, to a greater degree than before, the mystic Pythagorean doctrine of numbers, in connection with the *ideas* of Plato. Zeus, the father, ruling in heaven, he called Unity, as being uneven number and spirit; the world-soul, which operates through all things liable to motion and change, he styled Duality. This divine world-soul dwells in the heavenly bodies, the Olympic gods, the elements of nature, and also in terrestrial demons, whom he regarded as intermediate between gods and men. In his ethical teaching, he aimed at making the Platonic doctrines more directly applicable to ordinary life in individual cases, and pitched his standard of excellence very high. He held that virtue is in itself valuable, while other things are only so conditionally, and that it extended to thoughts as well as actions. He was himself of irreproachable character, of a well-balanced mind, and temperate in his habits without cynicism. His conversion of the youthful debauchee Polemo into an earnest, virtuous man, and his disregard for wealth, as shown by his refusal of the offers of Philip and Alexander, are the best-known incidents in his long, useful, and virtuous career.

XENOPHANES, founder of the Eleatic school of philosophy, was b. at Colophon, in Asia Minor, about 580 B.C., or, according to others, about 40 years earlier. He spent the greater part of a life which was prolonged beyond his 90th year, in banishment. He passed many years in Sicily, and resided for some time at Elea (whence adj. *Eleatic*), in Lucania. He composed many poems, historical, didactic, and elegiac, which have all perished, except a few fragments. He employed his poetry as the instrument for disseminating his philosophical tenets. He was the first to maintain the Eleatic doctrine of the oneness of the universe; and recognizing clearly the unity and perfection of the Deity, he attacked the prevalent mythology and the practice of attributing to the godhead a human form and human weaknesses. He was thoroughly in earnest, but his logic was confused and contradictory. While he held the existent to be identical with the Deity, and regarded it as the basis of phenomena, he also maintained that the divine essence was neither finite nor infinite, neither moved nor unmoved; not finite, for then it must be limited by another, whereas God is one; nor, on the other hand, infinite, for only non-being is infinite, as having neither beginning, middle, nor end. The distinguishing tenet of Xenophanes is his monotheism; and as a philosophical rhapsodist, he sought to inculcate it, though he failed to express it in a clear and systematic manner. His speculations are skeptical in their tendency, and appear to have had great influence upon succeeding philosophers. His explanations of physical phenomena were crude; but one is recorded in which he has anticipated modern geology. From the shells and marine petrifications found on mountains and in quarries, he inferred that the surface of the earth had risen gradually out of the sea. In the 18th c., Voltaire could give no better explanation of the fact of sea-shells being found on the mountains of Spain, than the supposition that they were the scallop-shells dropped by pilgrims journeying to and from the shrine of St. James.

XENOPHON, celebrated as a general, historian, and philosopher, was b. at Athens 445 B.C. At an early age, he became a pupil of Socrates, and is said to have been saved from death by that philosopher at the battle of Delium. At the age of 40 or thereabouts, he joined the expedition of the younger Cyrus against his elder brother, Artaxerxes Mnemon, king of Persia. After the battle of Cunaxa, and the treacherous massacre of the Greek generals, Xenophon played an important part in the adventurous retreat known in history as the retreat of the ten thousand; and it was his courage and conduct that contributed mainly to its success. After having returned to Asia Minor, Xenophon led a portion of his forces upon a pillaging expedition, and amassed wealth enough to enable him to live the life of a country gentleman. Before retiring, he served under Agesilaus, the Spartan general, against the Persians; and at Coeneca fought against his own countrymen. Sentence of banishment had been previously passed upon him at Athens, probably for his share in the Cýrean expedition. His sympathies were entirely Spartan. He soon afterward settled at Scillus, a small town near Olympia, in Elis, under Spartan protection, where he lived upward of twenty years, occupying himself with hunting, agriculture, and writing. He is not mentioned as having ever returned to Athens, though his sentence of banishment was repealed, and his two sons were in the Athenian division which aided the Spartans at Mantinea. At last, Xenophon was driven from his retreat at Scillus by the Eleans, and took refuge in Corinth, where he probably died, 359 B.C. His works are numerous, and to judge by their titles and number, all extant. His style is simple, elegant, but rather monotonous and deficient in vigor. As a philosopher, he holds no very high rank. He possessed excellent practical talents, was a humane, sensible, religious man, but seems to have had neither genius nor taste for speculative philosophy. His principal works are the *Anabasis*, or narrative of Cyrus's expedition and the retreat of the ten thousand; a history of Greece in continuation of Thucydides; the *Cyropædia*, or education of Cyrus the elder—a sort of political romance, in which Cyrus is drawn as the model of a wise and good ruler. In the latter work, Xenophon clearly shows his preference of a well-regulated monarchy to the democracy of his native country. He wrote besides the reminiscences (*Memorabilia*) of Socrates, a series of dialogues intended to refute the charges upon which that philosopher was executed; also treatises on hunting, on the horse, the revenues of Athens, and domestic economy.

XERES-DE-LA-FRONTERA, or **JEREZ-DE-LA-FRONTERA**, an important town of Spain, in the province of Cadiz, and 14 m. directly n.e. by n. from Cadiz, near the right bank of the Guadalete, and on the railway between Cadiz and Seville. The houses are generally well built, and the streets and squares clean, spacious, well paved, and well lighted. The wealthy wine-merchants mostly reside in the suburbs. Xeres-de-la-Frontera is an ancient town supposed by many to be the *Asta Regia Cesariana* of the Romans. Xeres-de-la-Frontera has manufactures of woolen cloth and leather, and a considerable trade in corn; but all these are of little consequence in comparison with its wine trade. *Sherry* derives its name from Xeres-de-la-Frontera. Some of its *bodegas*, or wine-stores, are of vast dimensions. They are not wine vaults, but stores erected above ground. The greater part of the wine of Xeres-de-la-Frontera is exported to England; and some of the principal wine-merchants are of French and Scottish extraction. Pop. about 50,000.

XERES-DE-LOS-CABALLEROS, or **JEREZ-DE-LOS-CABALLEROS** (anc. *Esuris*), a town of Spain, in the province of Badajoz, and 40 m. s. from Badajoz. Xeres-de-los-Caballeros is a picturesque old town, partly surrounded by a Moorish wall. The ecclesiastical edifices are remarkably numerous. There are manufactures of woolen and linen cloth. Among the chief articles of trade, besides the produce of the manufactures, are pigs and fruit. Pop. about 6,000.

XERXES I. (the name is perhaps akin to Sanskrit *kshatra*, king), king of Persia, was the eldest son of Darius and his second wife Atossa, and was appointed successor by his father, in preference to Artabazanes, his eldest son by his first wife, whose children were all born before Darius became king. Darius died in the beginning of the year 845 B.C., in the midst of his preparations for a third expedition against Greece. Xerxes, after having subdued the rebellious Egyptians, and appointed his brother Achæmenes governor, gave his whole attention to the completion of the preparations begun by his father, which occupied nearly four years. Immense hordes of men were gathered together from all parts of the vast Persian empire, from the steppes of Central Asia, from the banks of the Indus and its tributaries, and from the interior of Africa; an enormous fleet was furnished by the Phœnicians and other maritime nations subject to Persia; stores of provisions sufficient to support the immense army were collected at different points along the intended route of march. A bridge of boats, an English mile in length, under the superintendence of Egyptians and Phœnicians, was built across the Hellespont. The bridge, however, was destroyed by a storm, on which (according to the Greek historians), Xerxes ordered the heads of the engineers to be cut off, and was so enraged at the rebellious and disrespectful sea, that he ordered 300 lashes to be administered to it, and a set of fetters to be cast into it. Another bridge, consisting of a double line of boats, was built; and a canal was cut through mount Athos, at the point of the peninsula of Acte in Macedonia, on which the fleet of Mardonius had been

wrecked in 492 B.C. The preparations were completed in 481 B.C., and in the autumn of that year, Xerxes arrived at Sardis, where he wintered. In the spring of the following year, the vast assemblage began to march toward the Hellespont; and, according to Herodotus, it took seven days and nights to march across the bridge. After crossing the Hellespont, the march was continued along the Thracian coast toward Doriscus on the Hebrus, where a halt was made on a large plain, and the army numbered. The fleet drew up near to Doriscus. According to Herodotus, the whole number of fighting-men, military and naval, amounted to nearly 2,500,000, and the fleet consisted of 1207 ships of war, besides 3,000 smaller vessels. These numbers were considerably increased during the march between Doriscus and Thermopylæ by the Thracians, Macedonians, Magnesians, and other nations through whose territories Xerxes passed on his way to Greece. Herodotus supposes that the number of camp-followers, exclusive of eunuchs and women, would amount to more than that of the fighting-men; so that, according to him, the whole number of people assembled on this occasion would be considerably over 6,000,000, a number greater than the entire population of Ireland. This number is doubtless greatly exaggerated; still, it cannot be doubted that this was one of the greatest multitudes ever brought together for any purpose under the sun. Grote, who discredits the immense numbers given by Herodotus, nevertheless says: "We may well believe that the numbers of Xerxes were greater than were ever assembled in ancient times, or perhaps at any known epoch of history." This immense force moved on without resistance through submissive nations till it reached Thermopylæ (q.v.), where it was brought to a stand by the army of Leonidas (q.v.). Although the Greeks were entirely defeated and slain, it was not without heavy loss to the Persians. On the same day, and on the third day after, the Persian fleet, which had previously suffered severely from a storm, was defeated with heavy loss by the Greeks off Cape Artemisium in Eubœa. Xerxes continued his march on to Athens through Phocis, which he laid waste, and Boeotia, whose inhabitants joined him, with the exception of those of Platea and Thespia, which cities he burned. A detachment which he sent to attack Delphi met with a signal defeat. When Xerxes arrived at Athens (in the summer of 480, three months after crossing the Hellespont), he found the city deserted, the Athenians having sent their families to Trœzen, Ægina, and Salamis. Athens was destroyed. Meantime the two fleets had sailed round from Eubœa and taken up their positions in the narrow strait between Salamis and the Attic coast, where the famous naval battle of Salamis took place (Sept., 480 B.C.). See SALAMIS. Xerxes witnessed the fight from a lofty throne which he had caused to be erected on one of the slopes of mount Ægaleus,

"The rocky brow
Which looks o'er sea-born Salamis."

Xerxes was apparently confounded at the unexpected and inglorious result of all his mighty preparations for the overwhelming of Greece, and, becoming alarmed for his personal safety, fled, under an escort of 60,000 men, with all haste toward the Hellespont, which he reached in 45 days. The bridge of boats having been again destroyed by a storm, he crossed over to the Asiatic coast in a vessel. Mardonius was left with 300,000 men to carry on operations in Greece. In 479 B.C., the Greeks defeated Mardonius in the famous battle of Platea (q.v.), and on the same day gained another victory over the Persians at Mycale in Ionia. Next year (478 B.C.), the Persians lost their last possession in Europe by the capture of Sestos on the Hellespont. The war was continued for a few years longer, though the struggle was now virtually at an end. Little more is known of the personal history of Xerxes, except that, in 465 B.C., he was murdered by Artabanus, who aspired to the throne, and was succeeded by his son Artaxerxes. From all that is known of Xerxes, he appears to have been utterly ignoble in character, vain-glorious, licentious, cruel, cowardly—the very *beau-ideal*, in short, of the worst kind of eastern potentate. His history would be scarcely worth recording were it not for his connection with Greek history. His famous invasion was undertaken apparently for no other purpose than to gratify a weak-minded vanity, which was delighted with the idea of being able to assemble at one time "ships by thousands" and "men in nations," who were at the mercy of his unprincipled caprice.

XIMENES DE QUESA'DA, GONZALO, 1500-79; b. Spain: came to South America; was a judge in Santa Marta in 1635. Soon afterward he led an expedition against the Chibcha Indians, and at the head of 800 men, after great hardships, captured the cities of Itaca and Tunja in New Granada, found a large amount of treasure, and broke the power of the Chibchas. He founded the city of Bogota in 1538, visited Spain the next year, and received the title of marshal, and on his return to South America went in search of El Dorado. In 1572 he founded Santa Ageda.

XIMENES, FRANCIS DE CISNEROS, by which latter name he is commonly called in Spain, the well-known statesman, archbishop, and cardinal, was born of a humble family at Torrelaguna, in Castile, in 1437. He was educated at Alcalá de Henares, Salamanca, and finally Rome, where he obtained from the pope a provisional or prospective nomination to a prebend in the cathedral of Toledo. The archbishop, resisting the papal claim of "provisor," refused to admit Ximenes; and on his persisting in his claim,

put him in prison, where he was detained for a long period. On his release, he was named vicar-general of cardinal Mendoza at Sigüenza; but he gave up this preferment, and entered the Franciscan order in 1482. His reputation for piety and learning, led the queen, Isabella, to choose him, in 1492, for her confessor; and three years afterward, to name him archbishop of Toledo—a dignity which he refused to accept until he received an express command from the pope. Having yielded in the end, he continued as archbishop the life of mortification and austerity which he had practised in his monastery; and he applied to purposes of religion, charity, and public utility the whole of the princely revenues of his see. As confessor and confidential adviser of the queen, Ximenes, during the lifetime of Isabella, was the guiding spirit of Spanish affairs; and on her death in 1504 he held the balance between the parties of Ferdinand and Philip of Burgundy, husband of Joanna, the heiress of the crown. On the death of Philip in 1506, Ximenes was appointed regent, in consequence of the incapacity of Joanna and the absence of Ferdinand, and conducted the affairs of the kingdom through a most critical time with consummate skill and success. In 1507 he was created cardinal; and in the following year he organized, at his own expense, and himself accompanied as commander, the celebrated expedition, consisting of 10,000 foot and 4,000 horse, for the conquest of Oran, on the African coast. Ferdinand died in Jan., 1516, and on his deathbed named Ximenes regent of Spain till the arrival of his grandson Charles; and although the grandees had organized an opposition as well to himself as to the royal authority, Ximenes, by his prompt and able dispositions, overawed them into submission; and subsequently, by the same exercise of vigor and determination, quelled the incipient revolt of Navarre. In order to the better consolidation of the royal authority in Spain, Ximenes urged very strongly the speedy visit of Charles, who still lingered in his Flemish principality; but it was not till after the lapse of a year and a half that the king decided on his journey; and meanwhile the enemies of Ximenes had so worked upon his jealousy and pride, that he took the ungracious and ungrateful course of dismissing his faithful, but, as he feared, too powerful servant. Ximenes had set out to meet the king, and although laboring under great infirmities, continued to prosecute his journey, when he was seized with a mortal illness at Branguillas, near Aranda de Duero, where he died, Nov. 6, 1517.

As a statesman and administrator, the reputation of cardinal Ximenes is deservedly of the very highest. The social and political revolution which he effected in breaking down the feudal power of the nobles has often been compared with the analogous change wrought in France by Richelieu. But the revolution of Ximenes was, at least in its results, rather in the interest of the people than, like that of cardinal Richelieu, of the crown; and while it freed the sovereign from the unworthy position of dependence on the nobility, it established the municipalities and the communal representatives in the enjoyment of certain well-defined and undoubtedly substantial privileges and immunities. His munificence as a patron of religion, of letters, and of art, has been the theme of praise in every history of his time. The university of Alcalá de Henares, which he planned, organized, erected, and endowed, was a marvel of enlightened munificence in such an age, and may compare advantageously with even the most princely foundations of the most enlightened times. His Complutensian Polyglot (q.v.), besides being the first of its class, was, considering the resources of the period, perhaps the grandest in conception among the projects of its own order; and the perseverance with which, during the long period of fifteen years devoted to its preparation, he watched and directed its progress, is an evidence that it originated from a genuine love of sacred learning, rather than a passing impulse of literary enthusiasm. The cost of this gigantic undertaking amounted, on the whole, to 80,000 ducats. His expenditure on churches, hospitals, schools, convents, and other works of religion and benevolence, was on a scale of corresponding munificence. He maintained thirty poor persons daily at his own cost, and he regularly set apart one half of his income to the uses of charity.—See Hefele's *Der Cardinal Ximenes und die kirchlichen Zustände Spaniens* (Tübingen, 1851); Prescott's *Ferdinand and Isabella*.

XORULLA. See JORULLA, *ante*.

XYLOGRAPHY. See WOOD ENGRAVING, *ante*.

XYLOÏDIN is a substance which is precipitated in the form of a white powder, insoluble in water, alcohol, and ether, when water is freely added to a solution of starch in cold nitric acid. Its composition is not determined with positive certainty, but it is probably starch, $C_{12}H_{10}O_{10}$, in which either one or two atoms of hydrogen are replaced by a corresponding number of atoms of peroxide of nitrogen, NO_2 . According to prof. Miller, there is a substitution of two atoms, so that the formula representing xyloidin is $C_{12}H_8(NO_2)_2O_{10}$. It explodes when sharply struck, and burns with violence at 356° . By the action of reducing agents, it is again converted into starch.

XYLOL (Gr. *xylon*, wood) is an oily aromatic fluid with a strong refractive power, and boiling at about 263° . Its composition is represented by the formula $C_{16}H_{16}$, and it is regarded as the hydride of a non-isolated radical, $C_{16}H_9$, to which the name *xylyl* is given. Xylol, mixed with toluol, cumol, and cymol, is found among the oils which are separated from crude wood-spirit by the addition of water.

XYLOPHAGA (Gr. wood-eaters), a family of *coleoptera*, of the section *tetramera*, nearly resembling weevils, but differing from them in the want of a beak. They have short antennae, thickened toward the tips, and sometimes leafy from the base. The species are numerous, and are arranged in many genera. They mostly live in wood, on which they feed, both in their perfect and larval states. Some of them are very destructive to trees and timber. See BARK BEETLE and SCOLYTUS. Some of the xylophaga live in fungi and feed on them.

XYRIS. See YELLOW-EYED GRASS.

XYSYTHRUS, according to the Chaldean, historian Berosus, was king of Babylon at the time of the deluge. In the fragments of the history which have been preserved by Eusebius, it is said that many people of different tribes dwelt together on the plain of Shinar, without laws and in a barbarous manner; that a god appeared among them from the Persian gulf and taught them the arts of civilization; that thus Babylon was built and reigned over by 10 kings, the last of whom was Xysythrus; that he, warned of a coming deluge, built a ship in which he was saved; that when the waters retired the ship stranded on the mountains of Koordistan, and the king, going out of it, built an altar, offered sacrifices, and disappeared in the clouds. There is said to be a striking resemblance in many important features between this narrative of Berosus and that of Moses, and between them both and that translated by George Smith from the cuneiform inscriptions in the British museum.

Y

Y, THE last letter but one of the English alphabet, is derived from the Greek γ (v). It had no place in the earlier Latin alphabet, and only came into use by Roman writers in the time of Cicero in spelling words borrowed from the Greek. In the Greek of the classical age, v (γ) no longer retained its pristine power (Ital. u or Eng. oo), but had degenerated into a sound like the French u , or even nearer to i (ee); it could not therefore be represented by the Roman u or v , which had remained (and remains yet in modern Italian) undegenerated, and thus was appended to the Roman alphabet as a new character. Its use in native Latin words, as *ylea* for *silea*, *satyra* for *sativa*, is an error of modern editors. Italian has no y , but uses i instead, as *sinfonia*, symphony. The other modern languages of Europe have not only retained it in spelling words of Greek origin, but some of them substitute it for i in native words, generally in a very capricious manner. German orthography has recently been purged of this abuse; and in Dutch, where it had always the sound of English i (ai), the double character ij is now written. In English it is used to represent the semi-consonantal power of i or j (see I and J) in the beginning of a word and before another vowel, as *yoke* = Lat. *iugum* or *jugum* = Ang.-Sax. *ioe*; *young* = Ang.-Sax. *iong* = Ger. *jung*. It has been suggested that the practice of writing y at the end of a word instead of i , while we replace it by i on adding a syllable (e.g., *lovely*, *lordier*), may have arisen like the habit of giving a tail to the last unit of the Roman numerals (e.g., ij , $iiij$), in the wish to give a kind of finish to the word and please the eye. The would-be antique spelling y^e , y^i , for *the*, *that*, is a blunder, arising from mistaking the Ang.-Sax. \bar{y} (= *tho*) for a y .

YABLONOI MOUNTAINS, a name that has long had a place in the geography of the n.e. of Asia, designating a range of mountains which are found to have no existence, the locality in which they were supposed to be placed being an undulating plateau.

YACHT is a small vessel constructed so as best to insure strength, elegance, and speed, and exclusively employed for pleasure-sailing. Vessels of this sort were first constructed in this country in 1604, at which date a yacht was built by the king's master-shipwright for Henry, eldest son of James I. of England; the idea of such a vessel being taken from the Dutch, among whom they had been employed for some time previous. From this time yachting, steadily patronized by royalty, became a favorite pastime of the nobility and gentry, and there are now about 50 yacht clubs in the United Kingdom, possessing, according to the *Yacht List* of 1876, 3,164 yachts. This amusement is encouraged by government, mainly because it supplies an excellent training for seamen, who in time of war become available for the royal navy, while in time of peace they are no burden on the national treasury; and accordingly yachts are allowed to bear the ensign of the royal navy, supplemented by the special flag granted by the admiralty to each club, and to refit and revictual in the royal dockyards. The oldest yacht club in the United Kingdom is the *Royal Cork*, which, under the title of the "Water club of Cork," is known to have existed as early as 1720; and the next in order of seniority is the *Royal Yacht Squadron*, founded in June, 1815, and having its headquarters at Cowes, Isle of Wight. The club which stands first as to the number of its members and yachts is the *Royal Thames Yacht Club*, which was founded in 1823, and has its headquarters in London. Of the other clubs, 6 are Scotch (4 on the Clyde and 2 on the Forth), 8 Irish (2 at Queenstown, 2 at Kingstown, 1 at Dublin, 1 at Belfast, 1 at Carlingford loch, and 1 at loch Erne), and the rest English, being mostly located on the Thames, the channels between Southampton and the Isle of Wight, or the n. coast of Wales, from Liverpool to

Holyhead. More than half of these clubs have been founded since 1840. Yachting is gaining ground in foreign countries and in the British possessions, the United States ranking next to Great Britain and Ireland in the number and importance of her yacht clubs (the chief of which is the New York yacht club); and Holland, Belgium, France, Australia, Bermuda, Canada, and Russia have similar associations.

The principles adopted in the construction of yachts have fluctuated greatly, from the simple unpretending rig, small tonnage, and clumsy build of the early yachts of the royal Cork club, to the immense canvas area, larger size, and long narrow build of the yacht of the present time. The yacht of the early part of the century was built with a fine run aft, and a bluff bow; but about 20 years ago this style was supplanted by increased sharpness of bows and stern, a raking (slanting upward and backward) stern-post, more depth, the draught aft double of that forward, great fineness of the water-lines, narrow beam, and immense sails. The effect of these changes was a great increase of speed, attended, however, with certain defects: one of which was that the diminished breadth of beam injuriously affected buoyancy, and the yachts consequently were more liable to be wetted in a heavy sea. In 1851 the hollow manner in which the crack yachts of the principal clubs in England were beaten by the yacht *America* of the New York yachting club, showed their owners and builders that they had still much to learn in the way of improvement; and, with few exceptions, they wisely took the lesson. The *America* had great breadth of beam, comparatively little depth inside, an upright stern-post, extremely sharp entrance, and fine water-lines, and (the most remarkable feature) her maximum breadth considerably abaft the center. With the exception of the great breadth of beam, and little depth inside, all the other characteristic points of the American yacht were adopted by the builders of yachts in this country: the difference between the draught aft and forward was diminished; and the result of these changes has shown that they were great improvements.

The materials used in the building of yachts are wood, iron, and steel; wood alone, wood and iron together, iron alone, and steel alone, being the various ways in which the materials are employed. Yachts built of wood, or of wood and iron, are generally coppered, to protect the planking, and secure the smoothness of surface essential to speed. The considerations which determine the relative length, breadth, depth, etc., are treated of under SHIPBUILDING. Considerable stimulus is given to improvements in construction by the numerous prizes which are offered for competition by the various yacht clubs, and which amounted in 1875 to £14,000, besides cups. These small, but powerfully built and thoroughly sea-worthy vessels have traversed every sea on the globe; numbers make trips to Norway and the Mediterranean; a few visit America and the Indian and Southern oceans; and one or two have circumnavigated the globe. Some of the most remarkable performances of yachts are the voyage from New York to Liverpool of the *Charter Oak*, 23 tons, in 36 days; that of the *Sylbie*, 205 tons, from Halifax to Havre, in 16½ days; those of the *Inca*, *Katinka*, and *Vied*, 25 tons each, from England to Australia; and the great Atlantic yacht-race from New York to Cowes, in Dec., 1866, which was won by the *Henrietta*, 205 tons, after a voyage of 14 days. Yachts may be divided, according to the style of their rig, into cutters (q.v.), fore-and-aft and square topsail schooners (q.v.), and yawls (q.v.). The tonnage of these vessels is very variable, ranging from 3 to 420 tons in Britain, the average tonnage being 30 to 50 tons. Steam-yachts (screws) are now exceedingly common, their independence of wind making them very popular. The *Victoria and Albert* and the *Fairy*, both belonging to her majesty, are specimens of this class.

YACHT (ante). The first club of the United States was founded in New York in 1844; in 1845 a club house was built on the Hudson near Hoboken; and in the same year the first regatta was held in New York bay. In 1846 the first race was contested between the sloop *Maria*, 154 tons, owned by John C. Stevens, the commodore of the club, and the schooner *Coquette*, 74 tons, owned by J. H. Perkins; the course being 25 m. to the windward and return, from the light-ship off Sandy Hook. The race was won by the *Coquette*. In 1851 the victory of the *America*, belonging to the New York yacht club, gave a great impetus to yachting in this country, and changed English views as to the scientific principles of ship building. (See the preceding article). In 1866 the *Henrietta*, *Fleetwing*, and *Vesta* raced from Sandy Hook to Cowes for a purse of \$90,000. The *Henrietta* won in 13 days 21 hours and 55 minutes. In 1870 Mr. James Ashbury, a prominent English yachtsman, brought the *Cumbria* to this country. In the voyage over she defeated Mr. James Gordon Bennett's *Dawdless* by one hour only. In the race for the queen's cup (brought here by the *America*) the *Cumbria* was beaten by the sloop *Magie*, which won in 4 hours 7 minutes 54 seconds, actual time, the course being from Stapleton, Staten island, around the s.w. spit to the Sandy Hook light-ship and return, about 43 miles. In 1876 the Canadian yachtsmen sent the *Countess of Dufferin* to New York to contend for the queen's cup, but she also proved unsuccessful. There are now nearly 40 different clubs in this country. Among the largest, besides the New York club, may be mentioned the Brooklyn, the Eastern, and the Hudson River clubs. In 1880 the National yacht association held its first meeting in New York harbor. There were 40 yachts entered from 13 clubs. The winners in the different classes were the *Silence*, 3 h. 52 m. 37 sec.; the *Isonomy*, 4 h. 01 m. 16 sec.; the *G. B. Deane*, 4 h. 26 m.

02 sec.; and the *F. L. Sheppard*, 2 h. 52 m. 45 sec.; all actual sailing time. A pleasant custom of the various clubs is the summer cruise in company, when each day's sailing is considered as a race, and some sea-side resort like Newport is the terminus of the voyage. By special acts of congress yachts are given the privilege of coming into and leaving ports without entering or clearing at the custom-house or paying tonnage tax.

YADKIN, a co. in n.w. N. C., bounded on the n. and e. by the Yadkin river; about 300 sq. m.; pop. '80, 12,421—1544 colored. Iron is found. Co. seat, Yadkinville.

YAJNAVALKYA is the reputed author of the *S'atapatha-Brâhman'a* (See *Yajurveda*, under *VEDA*), and of a *Dharmas'âstra*, or law-book (see *SANSKRIT LITERATURE*, sec. *law*). His name points to his being a descendant of Yajnavalka, and, according to tradition, he was also a descendant of *V'isvâmitra* (q.v.), and belonged to a branch of the *Kus'ikas*. He seems to have occupied an influential position at the court of king Janaka of Videha. Nothing certain, however, is as yet known regarding the age at which he lived.

YAK, *Bos grunniens*, a species of ox found in Tibet, and domesticated there. It is ranked by col. Hamilton Smith in the genus *bison*, along with the bison, gaur, and gayal, and by Mr. Gray in the new genus *poephagus*. The wild yak of central Asia is the largest native animal of Tibet, and is found only near the limits of perpetual snow, descending into the higher wooded valleys in winter, and ascending in summer to the pastures of short grass and *carricks*, some of which are at an elevation of 17,000 ft. above the sea. It is hunted by large dogs, and is very fierce, falling upon an adversary not only with its horns but with its chest, and crushing him by its weight. It is generally black. The yak has been domesticated from time immemorial, and forms great part of the wealth of the inhabitants of the highest and coldest regions of central Asia. The domesticated yak is about the height of an English ox, which it much resembles also in figure of body, head, and legs. It is covered all over, however, with a thick coat of long silky hair, hanging down like the fleece of a sheep. The head is rather short; the eyes large and beautiful; the horns not very large, spreading, tapering from the base, a little turned back at the tips, a space between them on the forehead covered with a mass of curling hair; the nose is smooth and convex, the nostrils small. The neck is short; the withers high and arched; the rump is low; the legs are short. Over the shoulders there appears a bunch somewhat like that of the zebu, but it consists only of long hair. The hair of the whole ridge of the back is long and erect, but not harsh. The tail is covered with a prodigious quantity of long flowing hair, descending to the hock, and has much the appearance of a large bunch of hair artificially attached. Not a joint of it is visible. From the chest, between the fore-legs, issues a large pointed tuft of long hair. The hair of the shoulders, rump, and upper parts of the body, is comparatively thick and short; but that of the lower parts is long and straight, hanging below the knee, and sometimes even to the ground. Yaks exhibit great variety of colors; but black and white are the most prevalent. It is not uncommon to see the long hair on the ridge of the back, the tail, the tuft on the chest, and the legs below the knee white, while all the rest is jet black. The great quantity of hair, evidently a protection against the cold of the climate for which it is destined, gives the yak an apparent size far beyond the reality.

The yak does not low like an ox, but utters a short grunting sound like a pig, as the expression either of uneasiness or of satisfaction.

It delights in steep and rocky places. Hooker, in his *Himalayan Journal*, describes the calves as "the drollest of animals, like ass-colts in their antics, kicking up their short hind-legs, whisking their bushy tails in the air, rushing up and down the grassy slopes, and climbing like cats to the top of the rocks." The yak is capable of becoming very tame. The Tibetan girl calls the yak cow by a peculiar cry to be milked.

The milk of the yak is very rich, and the curd made of it is much used by the Tibetans, both fresh and dried, often powdered into a kind of meal. The butter made from yak-milk is excellent, and is preserved for a long time in the dry and cold climate of Tibet in bladders. It is an important article of Tibetan commerce. The flesh of the yak is of the finest quality; that of the calves is much superior to ordinary veal. Yak flesh is often dried in the sun by the Tibetans, and eaten raw. The yak is never used for tillage or draught, but is very much employed as a beast of burden, and travels at a slow pace 20 m. a day, where no other beast of burden could well be employed. The lazy and luxurious lamas of Tibet often ride upon it, an attendant leading the animal. The hair is spun into ropes, and made into coverings for tents. The soft fur on the hump and shoulders is made into a fine and strong cloth. Caps, jackets, cloaks, and blankets are made of the skin with the hair on. The tails are the *chouries*, or fly-flappers, used in all parts of India, and which are to be seen particularly on all occasions of state and parade, and sometimes in the hands of the meanest of grooms, sometimes of the highest officers of state.

There is much reason to think that the yak deserves a degree of attention which it has not yet received. It is still confined to its native region, whereas it is probably adapted to increase the productiveness and wealth of many parts of the world. It seems extremely suitable to Norway, Iceland, and other northern countries, and perhaps might be advantageously introduced into the highlands of Scotland. Its hair is probably fit

for other textile purposes than those to which it has been applied by the rude Tibetans.

YAKIMA, a co. in s. Washington territory; about 4,800 sq.m.; pop. '80, 2,811—2,458 of American birth. Co. seat, Yakima.

YAKSHA is, in later Hindu mythology, the name of a kind of demigods, who especially attend on Kúvera, the god of riches, and are employed in the care of his garden and treasures. According to the Vish'n'u-Purāṇa, they were produced by the god Brahman, as beings emaciate with hunger, of hideous aspect, and with long beards; but Brahmanic poetry generally represents them as inoffensive, and in the Meghadūta of Kālidāsa (q.v.), it is a Yaksha banished from his wife who utters the most poetical thoughts, and is capable of the tenderest feelings. The Buddhists, on the contrary, describe them in some of their legends as cruel demons, who feast on serpents and human corpses, and when filled with the flesh they have devoured, indulge in fierce combats; but in others, again, as beings who also delight in dances, songs, and amusements, and sometimes even enter the paths that lead to *nirvāṇa*. In Buddhist legends, they also possess the power of raising storms, and altogether occupy a far more prominent position than is allowed them in the Brahmanic pantheon.—See E. Burnouf, *Introduction à l'Histoire du Bouddhisme Indien* (Paris, 1844); the same author's translation of *Le Lotus de la Bonne Loi* (Paris, 1852); and Spence Harry's *Manual of Buddhism* (Lond. 1853).—The Yakshas of the Brahmanic mythology have wives, Yakshīs, who sometimes appear in the train of Umā (q.v.).

YAKUTSK. See JAKUTSK.

YALABUSHA, a co. in n. Mississippi; about 475 sq.m.; pop. '80, 15,653—15,435 of American birth—8,118 colored. Co. seat, Coffeeville.

YALE, ELIUR, 1648–1721; b. New Haven, Conn.; when ten years old was taken to England by his father, and never returned to America. From 1687–92 he was governor of fort St. George, Madras; and later, governor of the East India company. He was also a fellow of the Royal society. Yale college received his name in the charter of 1745. Previously the building had been called by the name. His gifts to the institution amounted to about £500 in money and many books.

YALE COLLEGE, an institution of learning in New Haven, Conn., founded in 1700 as the collegiate school of the colony of Connecticut, under the trusteeship of the ten principal ministers of the colony, who each contributed a gift of books. It was first established at Saybrook, and in 1716 removed to New Haven. Among its early patrons were governor Yale, whose name it bears, and bishop Berkeley. Of its four faculties, the medical was organized in 1812, the theological in 1822, the legal in 1824, and the philosophical in 1847. Its government consists of the governor and lieutenant-governor of the state, six fellows, its president and ten ministers. The library has about 80,000 volumes. There is a geological and mineralogical cabinet of 30,000 specimens, and the college has the historical pictures and portraits of Trumbull. It has 100 instructors and about 1000 students, and has had about 10,000 graduates.

YALE COLLEGE (*ante*) received its first charter in 1701 from the colonial assembly, and in the succeeding year Nathaniel Chauncey received the first degree granted. The sessions were held in that part of Killingworth now known as Clinton until 1707, Abram Pierson being the first rector of the collegiate school. The removal to New Haven took place in 1716, and valuable gifts from Elihu Yale (q.v.) led the trustees to call the first college building by his name. The title Yale college was formally adopted in the charter of 1745. In this the provision was retained that the ten ministers who founded the institution and their successors, perpetually, should be the trustees of the college. In 1792 the governor and lieutenant-governor of Connecticut and the six senior state senators were made *ex officio* members of the corporation. In 1871 the charter was so changed as to substitute for the state senators six graduates of the college, one being elected each year by graduates of not less than five years' standing. The following is a list of the rectors and presidents: Abram Pierson, 1701–7; Timothy Cutler, 1719–22; Elisha Williams, 1726–39; Thomas Clapp, 1739–66; Naphtali Daggett, 1766–77; Ezra Stiles, 1777–95; Timothy Dwight, 1795–1817; Jeremiah Day, 1817–46; Theodore D. Woolsey, 1846–71; Noah Porter, 1871 to the present time. Among the earlier donors besides gov. Yale were bishop Berkeley and James Fitch. The total number of recipients of degrees of various grades is now a little over 12,000. The buildings of the academical department occupy one of the squares in which New Haven was originally laid out, in the center of the city. Back of the beautiful college green, with its noted elms, stands the line of old brick buildings, seven in number. The first brick dormitory was erected in 1752. The more modern buildings stand on the part of the square adjoining the street, the design being to form in time an inclosed quadrangle. The finest dormitories are Farnam and Durfee halls. Between the two stands the new Battell chapel, completed in 1875. On the opposite corner stands the alumni hall, and near it the large and fire-proof library building. In 1880 the number of members of the faculty and instructors in all departments was 105. There were in all 1037 students, of whom 612 belonged to the undergraduate academical department. Examinations are held for admission to this department in Chicago and Cincinnati each summer, as well as at New Haven. In the

last two years of the course the branches of study pursued are, in great part, optional. Over \$12,000 is applied yearly to the aid of students requiring pecuniary assistance. There are three fellowships, yielding about \$600 each, and open to recent graduates; also several scholarships and many lesser premiums and prizes, that most coveted being the De Forest prize medal, awarded "to that scholar of the senior class who shall write and pronounce an English oration in the best manner." The largest class graduated from the department is that of 1879, containing 131 members. The college library proper has nearly 100,000 volumes, besides a very large number of unbound pamphlets. There is also a library of over 20,000 volumes of miscellaneous literature, known as the Linonian and Brothers library, from the two societies by which it was founded. The libraries of the professional schools number about 18,500 volumes. The Sheffield scientific school, occupying buildings a short distance from the main college, had in 1880, 190 students and 25 members of the governing board and instructors. It grants the degrees of bachelor of philosophy, civil and dynamic engineer, and doctor of philosophy. The school was organized in 1840 as a school of applied chemistry; in 1860 large donations were received from Joseph E. Sheffield of New Haven; and in 1863 the Connecticut legislature gave to it the proceeds (about \$8,000 annually) of the national grant of 1862, "for the benefit of agriculture and the mechanic arts." The course of study for the Ph.D. degree is three years. Prof. George J. Brush is chairman and executive officer of the governing board. The theological department occupies two large halls on Elm street, opposite the Battell chapel. The two wings are connected by the Marquand chapel, a small but elegant building. It was founded as a Congregational school in 1822. The course is three years. By private and church donations the students are provided with furnished rooms rent free. In 1880 there were 93 students. The president of the college is also president of the theological department. Other well-known members of the faculty are rev. Leonard Bacon, D.D., LL.D., rev. George P. Fisher, D.D., LL.D., and rev. George E. Day, D.D. The school has a reference library of 2,000 volumes, and a valuable library of church music presented by the family of the late Lowell Mason. The law school became a department of the college in 1822, and now occupies rooms in the county court-house. It had, in 1880, 64 students and 11 members of faculty and instructors. Francis Wayland, LL.D., is dean of the faculty. The degree of LL.B. is given after a two years' course of study, and that of M.L. after one, and D.C.L. after two years' subsequent study. The law library, one of the most complete in the country, has over 8,000 volumes, and was established by ex-gov. James E. English in 1873. The medical school was founded in 1813, and in 1814 received grants of money from the state. The number of instructors (1880) was 18; of students, 25. Dr. Chas. A. Lindsley is dean of the faculty. The full course is three years, but residence for that time is not required. The school of the fine arts occupies one of the finest college buildings, situated in the general college grounds. This was the gift of the late Augustus R. Street of New Haven. Instruction is given in drawing, painting, sculpture, and architecture. Prof. John F. Weir is director of the school. Women are admitted to the course. The gallery of the college includes the James collection of Italian works, the Trumbull gallery, and other pictures, statues, casts, and marbles. Besides the departments mentioned Yale furnishes many courses of post-graduate study in various directions, which may be pursued with or without the intention of applying for the Ph.D. and M.A. degrees. In 1866 the late George Peabody of London gave to a board of trustees the sum of \$150,000 to found a museum of natural history in connection with Yale college. From this fund and its accumulations was erected the first wing of the Peabody museum at an expense of \$175,000. This wing is itself the largest and, for its purpose, the best of the college buildings. Part of the fund still remains, and when it has sufficiently accumulated the building will be completed. The collections are open to the public. A most interesting and complete account of the material and intellectual history of the college may be found in *The Yale Book*, published in 1878 in two large quarto vols. by Henry Holt & Co. of New York.

YAM. *Dioscorea*, a genus of plants of the natural order *dioscoreacea*, distinguished by an inferior ovary and membranous winged fruit. The species are mostly tropical, natives of the East and West Indies, etc. They have tuberous roots and herbaceous twining stems. The great fleshy roots of some of them are very much used as an article of food, in the same way that potatoes are in more temperate climates. They contain much starch, and generally become somewhat mealy and pleasant to the taste when boiled. This, however, is not the case with all; the roots of *D. triphylla*, *D. demonum*, *D. rufosa*, and several other species with ternate leaves are very nauseous even when boiled, and are poisonous. The tubers of all the yams contain an acrid substance, which, however, is dissipated by boiling, except in the species with compound leaves. The WINGED YAM (*D. alata*) is an article of food in daily use in the South Sea islands. The roots are 1½ to 3 ft. long, and often 30 lbs. in weight, with a brownish or black skin, juicy and reddish within. They vary exceedingly in form. The stem, which is winged, twines up tall poles which are provided for it by the cultivator; the leaves are between heart-shaped and arrow-shaped. Two or three small tubers are generally found in the axils of the leaves. It is supposed that this species may be the original of most, or perhaps all, of the yams cultivated in the tropical parts of Asia, Africa, and America—as the common yam of the West Indies (*D. sativa*), which has a round stem and heart-

shaped leaves; *D. bulbifera*, in which the tubers in the axils of the leaves attain the size of apples; the prickly yam (*D. aculeata*), which has a prickly stem, and a fasciculated, tuberous root; *D. globosa*, the most esteemed yam of India, which has very fragrant flowers, and roots white internally; *D. rubella*, another Indian kind, with tubers sometimes 3 ft. long, tinged with red below the skin; etc. The species are not well ascertained. Yams are propagated by means of their tubers; the small axillary tubers, or the small tubers produced at the base of the stem around the neck of the large tuber, being used for this purpose.—A species of yam (*D. batatas*) has recently been brought from the temperate parts of China, where it appears to have been long in cultivation, and is found to succeed well in France. It is hardly enough to endure the climate even of Scotland without injury; but the heat of the summer is not sufficiently great and long-continued for its profitable growth, so that, in general, the plant merely lives, without producing a large tuber. The root is of very fine quality, and attains a very considerable size. The stem requires the support of a pole, round which it twines; the leaves are more elongated and acuminate than those of the West Indian yams; the root strikes perpendicularly down into the ground, and forms its tuber often at a very considerable depth, which is sometimes inconvenient to the cultivator; but this is prevented by putting a slate under it.

YAMA, the Hindu god, who, at the epic and Purân'ic period of Hinduism (see INDIA, sec. *religion*), is the sovereign of the manes, and the judge of the dead, is, in the hymns of the R'igveda, a son of *Vivas'wat* and *Saran'yâ*, and a twin-brother of *Yami*, whose desire to become his wife he resists. His father is sometimes also called the *Gandharva*; and he is further represented there as possessing two four-eyed dogs, which guard the road to his abode (see J. Muir, "Yama and the Doctrine of a Future Life, according to the R'ig-, Yajur-, and Atharva-vedas," in the *Journal of the Royal Asiatic Society*, New Series, 1865, vol. i. p. 287, ff.). The idea represented by these mysterious deities has been differently understood. Prof. Roth takes *Vivas'wat* for the light of heaven, *Saran'yâ* for the dark storming cloud, and Yama and Yami as representing the first human pair—the originators of the race, or the Vedic Adam and Eve produced by the union of the damp vapor of the cloud and the heavenly light. The Vedic hymns, however, do not afford the slightest ground for such a fantastical interpretation of these names; and as regards that of Yama and Yami, they discountenance it even distinctly by describing Yama as resisting the sexual alliance with his sister. Prof. Max Müller understands *Vivas'wat* to represent the sky; *Saran'yâ*, the dawn; *Yama*, the day; and *Yami*, the night (*Lectures on the Science of Language*, 2d Series, Lond. 1864, p. 509, ff.). But this interpretation, too, is open to the strongest doubts, inasmuch as there is no valid ground for identifying the luminous deity *Vivas'wat* with the sky, or *Saran'yâ* (from *sarānā*, going, moving) with the dawn. It seems more probable that the phenomena symbolized by this myth are not of a luminous, but of an aerial character; the kindred myth of a luminous character being that of the *As'vins*, who are likewise the twin progeny of *Vivas'wat* and *Saran'yâ*, or rather of *Vivas'wat* and "a form similar to that of *Saran'yâ*," and who represent the transition from darkness to light, and the inseparable duality produced by the intermingling of both (see J. Muir, "Contributions to a Knowledge of the Vedic Theogony and Mythology, No. 2," in the *Journal of the Royal Asiatic Society*, vol. ii. 1866). For as *Vivas'wat*, "the expanding," probably implies the firmament "expanding" to the sight through the approaching light, *Gandharva*, as usual, the solar fire, and *Saran'yâ*, the dark and cool "air" (the moving element), Yama and *Yami* seem to represent the current of air produced by the effect of the solar heat emanating from the firmament on the cool air of the night, when the antagonism between the warm and cold air of which this current consists would be Yama repelling the union with his sister *Yami*, though, at the same time, they are "husband and wife while yet in the womb" (of the night-air). And since this phenomenon extends over the whole atmosphere, the two four-eyed watch-dogs of Yama are probably the eight or twice-four regions of the compass, either each couple of them taken together with their intermediate regions—whence both dogs are called spotted—or the four regions and the intermediate four taken separately—whence one dog is also called *dark*, and the other *spotted*. Yama being produced by the solar heat, it becomes then intelligible why it is said of Agni, the (solar) fire, that he is born as Yama, and Yama being a phenomenon of the air, why he is also identified with *Vāyu*, the wind, and why the intermediate space between heaven and earth is assigned to him as his domicile. It is probably a later conception of the Vedic period which describes this abode as having been made for him by the spirits or *manes*, and Yama as having been the first who found his way to it; and a still later one, which represents him as the first of *mortals* who went to that world, for in passages where these ideas are expressed, there is an association between the moving air and departed life which is foreign to the oldest notions of the Vedas. It led to the position which subsequently Yama assumed as a luminous king who dwells together with the manes, and as the lord of death—death then becoming his messenger. Yet in the R'igveda, he has not yet the office of judge of the dead which is assigned to him in the later mythology of the epic poems and Purân'as, and probably already in some of the Upanishads. At the epic and Purân'ic period, Yama entirely loses his cosmical character, though he is still called the son of *Vivas'wat*. He then marries 13 daughters of the patriarch

Daksha, is installed as the king of the manes, becomes the regent of the south, and resides in Yamapura, a town of the infernal regions, where he sits in judgment over the souls of the departed which are brought before him. They are generally fetched by his messengers, who draw them with nooses out of the bodies which they animated; but in the case of very pious persons he assumes himself the function of separating the soul from the body. After the soul has been brought before him he orders his recorder, *Chitragnpta* or *Chandragupta*, to read to him an account of all the good and bad actions it had done during its life, and which are kept registered in a book called *Agrasandhāni*; and according to their merit or demerit, it is sent to heaven or the infernal regions. The precise knowledge which the Purāṇas pretend to possess of all these proceedings also extends to the description they give of this recorder, and to their enumeration of the assessors who co-operate with Yama at his court.—Yama's sister is *Yamunā* (q.v.). Among his other names, *Dharma* ("justice"), *Dharmarāja* ("king of justice"), *Antaka* ("the ender"), *Kāla* ("time"), and *S'riddhadeva* ("the god of the S'riddha," q.v.), are of usual occurrence.—When represented he is of grim aspect; his color is green, his garments red, and he rides on a buffalo with a crown on his head, in one hand holding a club, and in another the noose.

YAMASKA, a co. in central Quebec, Canada, bounded on the n.w. by lake St. Peter and the St. Lawrence river; about 250 sq.m.; pop. '71, 16,137. Capital, St. François du Lac.

YAMBU, or **YEMBO** (*Iumbia* of Ptolemy), a maritime t. of Arabia, on the coast of the Red sea, about 130 m. s.w. of Medina; stands on the edge of a barren plain that extends between the mountains and the sea, fronting the northern extremity of a narrow winding creek. It shares with other places the title of "Gate of the Holy City," and is the third quarter of the caravan road from Cairo to Mecca, and is thus a place of considerable importance. Yambu being the port of Medina, is supported by a considerable transport trade and extensive imports from the western coasts of the Red sea. The harbor is good and well sheltered. It is surrounded by walls with turrets, outside of which are a few domes and tombs. The streets are wide, the houses stand at a considerable distance from each other, are built of limestone and coralline, and have huge hanging windows. There is a large market-place, a custom house, some white-washed mosques of a very simple form, and a few caravanserais. According to Burton, "there is an independent bearing about the people, strange in the east; they are proud without insolence, and look manly without blustering. Moreover, the population has a healthy appearance." Pop. between 6,000 and 7,000. See Burton's *Pilgrimage to El-Medīnah and Meccah* (1855).

YAMHILL, a co. in n.w. Oregon, bordering on the Coast mountains; 750 sq.m.; pop. '70, 5,012. Co. seat, Lafayette.

YAMUNA, the modern Jumna, is one of the sacred rivers of the Hindus, mentioned as such as early as in the hymns of the *Rigveda*. Bathing in it, especially where it falls into the Ganges, at Allahabad, was at a later period, and is now, supposed to have the efficacy of removing sin, because at Allahabad the god Brahman is said to have performed a great horse-sacrifice—whence this place is termed *Prayāga*, literally "sacrifice," or *Bhatt'aprayāga*, literally "the best sacrifice." (Though Allahabad, which is a celebrated place of pilgrimage, is the *Prayāga*, this term is also applied to other places where two sacred rivers meet, four of which, situated at the confluence of the Ganges with the Alakanandā, Pindar, Mandākinī, and Bhāgirathī, are, besides Allahabad, held in especial sanctity, and severally called *Nanda*-, *Karnā*-, *Rudra*-, and *Devā*-*Prayāga*.) In the Purāṇic mythology, the *Yamunā*—in Sanskrit, a word in the feminine gender—is called a sister of the god *Yama* (q.v.); and a legend is also told in regard to her, according to which Balarāma, the brother of Krīṣṇa (see *Vṛṣṇa*, the 8th *Avatāra*), once ordered the river to come to him, and as she disobeyed his bidding, plunged his ploughshare into her banks, and dragged her to him. *Yamunā*, the legend continues, was thus compelled to quit her ordinary course, and to follow Balarāma whithersoever he went. At last, however, appeased by her entreaties, he let her go, after she had watered all the country. Prof. Wilson appends to this legend, where occurring in his translation of the *Vishnu Purāṇa*, the following remark: "The legend probably alludes to the construction of canals from the Jumna, for the purposes of irrigation; and the works of the Mohammedans in this way, which are well known, were no doubt preceded by similar canals dug by order of the Hindu princes."—*Vishnu Purāṇa* (Edn. 1840, p. 572).

YANCEY, a co. in n.w. North Carolina, bordering on Tennessee; about 600 sq.m.; pop. '80, 7,693—7,692 of American birth, 325 colored. Mount Mitchell, in the s.e. part, is 6,500 ft. high. Co. seat, Burnsville.

YANCEY, WILLIAM LOWNDES, 1814–63; b. Georgia; son of Benj. C. of S. C.; educated at the north; studied law, and was admitted to the South Carolina bar. In 1836 he settled in Alabama, was a newspaper editor and politician, and in 1844 was elected to congress. He was an extreme democrat, and one of the foremost advocates of secession. In 1859 he favored the election of Breckenridge. In 1861 he introduced the ordi-

nance of secession into the Alabama legislature. During the war he was a member of the confederate congress, and an agent of the government in Europe.

YANG-TZE-KIA NG, "son of the great river" or "sea," the principal river of Asia, the "girdle of China," connecting together all the central provinces of that empire, situated between Tibet and Kokonor on the w. and the Pacific ocean on the east. Its entire length through all its numerous windings, under its various names, can hardly be less, but rather more than 3,000 miles. If regard be had to its tributaries and to the cities to which its waters give access, to the richness of the soil, and the variety of the products along its banks, and above all to the vast population scattered far and wide over the valleys, and plains, and hill-sides drained by it and its confluent, the Yang-tze-kiang has no equal on the globe. It takes its rise in the same elevated regions of central Asia which give birth to the Brahmaputra, Makiang or Mekong, Salween, and Iwang-ho or Yellow river. Its course at first is southward, winding its way through an apparently level country, and bearing the name *Mura Ussu*, or Tortuous Waters. The magnitude of the stream must be considerable even in these upper regions, for it was here, beyond the Bayen Khara mountains, that the missionary traveler, M. Hue, in the winter of 1845, saw a herd of wild oxen that had perished, having got frozen up in the ice while attempting to cross the river. Leaving these upper regions, after traversing the wide territory of Kokonor, the Tortuous Waters run southward, and enter the province of Yun-nan at about 28° n. lat. The river then flows in a south-east direction through this province, and at about 26° n. lat. and 103° e. long., it turns north, forming part of the boundary between the provinces of Yun-nan and Sze-chuen. After entering the latter province, it flows in a n.e. direction under the name of *Kin-sha-kiang* (river of golden sands), receiving at this part of its course many tributaries. On the s., the tributaries of the provinces of Yun-nan and Kwei-chow are numerous, but not large; the principal one, the Oo or Woo, flows through the latter. On the n., the tributaries are numerous and large, the principal being the Ya-loong, the Min or Wen, and the Kia-ling, which force their way through narrow passes, rolling over lofty precipices, and carrying with them large masses of ice. Two of these rivers are each more than 1000 m. in length. It enters the province of Hu-pe at about 110° e. long., shortly before which it receives the name of *Ta-kiang* (Great river). The Great river next runs east-by-north through the entire length of the province of Hu-pe, receiving in its progress the waters of many lakes and rivers, the principal being the *Han-kiang*, from which the most illustrious dynasty takes its name, which in turn gave to Chinamen the name of which they are most proud—sons of Han. The two provinces Hu-pe and Hu-nan—i.e., "north of the lakes" and "south of the lakes"—contribute, by natural or artificial channels, to augment the main stream. One of these lakes, the Tung-ting-hu, is the largest in China, having an area of 300 sq. miles. After receiving the waters of these lakes, the river proceeds in a north-eastern course through the province of Ngan-hwui, in which part are situated the cities forming the great mart Han-kow. Skirting the n. of the province of Keang-se, it receives the waters of the Po-yang lake, which receives nearly the whole of the waters of the province of Keang-se, and, like the Tung-ting-hu, pours all its contents into the Great river. Thence moving in a n.e. direction, it becomes broader and deeper as it traverses the province of Ngan-hwui, receiving tributaries from both banks. Entering Keang-su, and passing Nankin, it travels southward, intersecting the "Transport river, or Yun-ho—i.e., the Grand canal. Through the whole of this province it receives tributaries, helping to swell the flood of waters, till in one broad expanse, several miles in extent from n. to s., they disembody into the Yellow sea. To name the cities on the banks and tributaries of this rival of the Mississippi, would be to enumerate a large portion of the cities of the empire. It is navigable by ships of the largest class to 900 m. from its mouth, and for smaller vessels to upward of 1500 miles. There is a large steam traffic on it up to Han-kow, nearly 700 m. from its mouth. By the treaty of Tien-tsin, the Yang-tze-kiang was opened to foreign commerce as far Han-kow; and speedily English and American steamers were found plying between Shang-hae and Han-kow.—Dr. Bridgman in the *North China Herald*.

YANINA. See JANINA.

YANKEE—YANKEE DOODLE. Yankee, the popular name for a New Englander in America, and in Great Britain often applied indiscriminately to the whole population of the United States, was in its origin a corruption of the word English as pronounced by the Indians (Yenghies, Yanghies, Yankees). It seems to have been first applied about 1775 by the British soldiers as a term of reproach to the New Englanders, who themselves afterward adopted it.—Since the war of secession, the southern population apply it to the northern people generally.

The air known as *Yankee Doodle* was originally *Nankie Doodle*, and is as old as the time of Cromwell, to whom, under that name, the doggerel words belonging to it seem to have had a reference. It was known in New England before the revolution; and one account of its appropriation in America, as a national air, is that after the battle of Lexington, the brigade under lord Percy marched out of Boston, playing it in derisive allusion to the then popular nickname of the New Englanders; and that afterward the New Englanders, saying that the British troops had been made to dance to *Yankee Doo-*

He, adopted the air as they had adopted the nickname. The citizens of the United States do not now recognize *Yankee Doodle* but *Hail, Columbia*, as their national air.

YANKTON, a co. in s.e. Dakota, separated from Nebraska by the Missouri river; about 520 sq.m.; pop. '80, 8,390—4,834 of American birth. Co. seat, Yankton.

YANKTON, a city, the co. seat of Yankton co., and capital of Dakota territory, on the n. bank of the Missouri river, a few miles above the mouth of the Dakota, on the Sioux City and Dakota railroad; pop. '80, 3,431. It stands on a level plateau, about 1200 ft. above the sea-level, and covers some 800 acres. The streets are wide, and laid out at right angles. It has a court-house a jail, churches, schools, banks, and 4 newspapers, one of which is German, and one daily. The city is connected with Fort Benton by steamers, which run regularly except in winter. It has grain elevators, breweries, railroad machine-shops, and flour-mills. It is a distributing point for supplies to the Indian agencies and military posts. The city, which is named after the Yankton Indians, was incorporated in 1869.

YAPOCK, *Chironectes palmatus*, a marsupial quadruped of the opossum family, *didelphidae*, the only known species of its genus. It differs from the opossums in having only five molars on each side of each jaw, in its aquatic habits, and its incapacity for climbing trees. The muzzle is rather sharp; the ears naked and rounded; the tail long, scaly, and prehensile; the feet webbed; the hind-feet with an opposable thumb. The Yapock inhabits Brazil and Guiana. It is rather larger than a rat. It is of a brown color, with three transverse gray bands, white on the under parts. It feeds on crustaceans, fishes, etc. It has cheek-pouches, in which it stows away its food.

YAQUIS, or **HAQUIS**, a tribe of Mexican Indians, living on the Yaqui river, and kin to the Pima tribes. From 1735 to 1841 they were constantly in revolt against the Spanish and Mexican government, and showed great courage and skill in warfare. They are better advanced in civilization than most Indian tribes, and are industrious and well behaved. Stock-breeding is their chief pursuit, but farming and mining are carried on in some parts.

YAR, or **YARE**, a river of the county of Norfolk, rises about the middle of the county, flows e. past Norwich, and, receiving the Waveney, widens into the estuary of Breydon Water, is joined by the river Bure at Great Yarmouth, $2\frac{1}{2}$ m. below which it enters the North sea, after a course of about 30 miles.

YARD (A.-S. *geard*, *gyrd*, Ger. *gerle*, a rod or wand), the British standard measure of linear dimension (see WEIGHTS AND MEASURES), is sub-divided into feet and inches. The yard contains 3 ft., and each foot 12 inches. The terms "yard" and "ell" (the ell being, however, equivalent to $1\frac{1}{4}$ yards) are frequently (*commonly*, according to Records) used synonymously by old authors.

YARD, in the rigging of a ship, is a timber which, when in its normal position, is borne horizontally at right angles to the ship's length at one of several heights on a mast, for the purpose of sustaining and spreading a square sail. It is upheld by the "lifts," and trimmed out of its right angle to suit the wind by the "braces." The lower sails or courses are upheld by the main, fore, or mizzen yards. Above these are the topsail-yards, the topgallant-sail-yards, and the royal-yards.

YARKAND, the commercial capital of eastern Turkistan (pop. not less than 155,000), is situated in $38^{\circ} 24'$ n. lat., and $77^{\circ} 14'$ e. long., near a river of the same name. Until Yarkand was visited by Mr. Shaw, in 1868, we had little reliable information concerning it. He found it to contain long streets, covered in against the rays of the sun, with rows of fine shops, in which goods of every sort, and from every country, were exhibited. He found the bread excellent; the supply of vegetables varied and abundant; the butchers' shops well provided with horse-flesh, camel beef, and mutton. The population seemed industrious, orderly, and well skilled in many of the arts of civilized life. In 1877, eastern Turkistan (q.v.) was retaken by the Chinese, and Chinese rule was re-established at Yarkand.—See Shaw's *High Tartary, Yarkand, and Cashgar* (1871); Boulenger's *Life of Yakoub Beg* (1878).

YARMOUTH, a co. in s.w. Nova Scotia, bordering on the Atlantic ocean; 736 sq. m.; pop. '71, 18,550—4,852 of French descent. Fishing is the chief occupation. Co. seat, Yarmouth.

YARMOUTH, a t. and co. seat of Yarmouth co., Nova Scotia; 140 m. s.w. of Halifax; pop. '71, 5,335. The making of iron castings, machinery, and wooden ware, ship-building, and fishing are the principal industries. There are 4 banks and 2 weekly newspapers.

YARMOUTH, GREAT, a municipal and, until 1867 when it was disfranchised for corruption, a parliamentary borough returning 2 members to parliament, an important seaport, and fishing and sea-bathing t. on the e. coast of Norfolk, 19 m. directly e. of Norwich, and $20\frac{1}{2}$ by railway. It stands about $2\frac{1}{2}$ m. above the mouth of the river Yare, on a slip of land about a mile and a half broad, washed on the w. by the Yare, and on the e. by the North sea. Between the town and the suburb of Southtown, or Little Yarmouth, on the right bank of the Yare, in Suffolk, communication is established by means of a bridge. Connected with Southtown is the village of Gorleston, near the mouth of the

river. The principal streets of Yarmouth run parallel to the river, and are intersected by about 150 cross lanes or "rows," which, as a rule, are so narrow as to be impassable for ordinary wheel carriages, being generally not more than from 5 to 8 ft. wide. The vehicles, by means of which traffic is carried on in the rows, are called "Yarmouth carts." They are low, narrow, and well suited for conveying heavy goods. A quay of nearly 2 m. runs along the river, and here are the town-hall, the council-chamber, and several other handsome buildings—the finest houses, however, being those built along the esplanade on the beach. There are many churches, schools, and other public buildings, including a sailor's home, fisherman's hospital, and military asylum, the principal church being that of St. Nicholas, founded in the 12th c., a handsome cruciform building with a tower and spire 168 ft. high. The town also contains a monumental column 144 ft. high, to the memory of Nelson. On the coast are several batteries, three piers, besides two at the harbor mouth, several public gardens, and a marine drive and promenade 2 m. long. Vessels of over 200 tons can enter the harbor, which is formed by the Yare. Yarmouth is the principal seat of the English herring-fishery; which employs above 1000 boats, and nearly 5,000 hands; deep sea fishing, the produce of which is forwarded daily to London, is also carried on, and employs many hands. The curing of fish, especially of herrings, is important, there being consumed for this purpose about 10,000 tons of salt annually; and the "Yarmouth bloater" is highly esteemed in London and throughout the country. In 1878, 1455 vessels, of 181,760 tons, entered the port, and 1499, of 186,478 tons, cleared. An extensive export trade in agricultural produce, herrings, and malt is maintained. Ship-building is carried on, and the manufacture of ropes, sails, nets, and silk goods; there are also foundries, tan-works, and flour-mills. Three weekly newspapers are published at Yarmouth. The coast is dangerous, but in Yarmouth roads, inside a line of sand-banks, there is safe anchorage. Pop. '71, 41,819.

YARN. The name applied to the thread spun for the purpose of weaving cloths of various kinds. It varies not only in the materials of which it is made, but also in the fineness to which it is spun. This latter quality is of great importance, as upon it depends entirely the evenness and quality of the manufacture. In order that uniformity may be insured, a pound of the material is taken as the standard, and this is divided into *hanks* or *cuts*. Thus, with linen yarn, a hank or cut consists of 300 yards; and if it takes 25 of these hanks to make a pound, the yarn is called 25s; and if 40, 40s; and so on. A hank of wool or cotton consists of 840 yards. No material admits of such fine spinning as cotton. Messrs. Thomas Houldsworth & Co. of Manchester have probably produced the finest—that is the thinnest—cotton yarn ever seen; they have produced 700s, of which muslin has been made, and this is the finest ever woven; but to test the wonderful perfection of their machinery, they have produced yarn of No. 2,150—much finer than that of the famous Dacca muslin. A pound of the finest Sea Island cotton spun of this fineness, would be 1000 m. in length.

YAROSLAV. See JAROSLAV.

YARROW. See ACHILLEA.

YAR'ROW, a Scottish stream, rendered famous by song and ballad, rises a little over a mile e. of loch Skene, at the place where the counties of Dumfries, Peebles, and Selkirk meet. It flows in a general n.e. direction through Selkirkshire, and joins the Ettrick about 2 m. above the town of Selkirk, after a course of 25 miles. About $3\frac{1}{4}$ m. from its source it expands into the loch of the Lowes, which is a m. long, and a quarter of a m. broad. Leaving the loch of the Lowes, the small stream enters St. Mary's loch, separated by a narrow neck of land, on which stands St. Mary's cottage (Tibby Shields'), from the other and smaller lake. St. Mary's loch is $3\frac{1}{2}$ m. long, and nowhere broader than 7 furlongs. The peaceful grassy hills which surround the loch slope downward to the water's brink, uninterrupted by trees, and compose a scene of great quietude, over which broods the spirit of "pastoral melancholy." The prevailing calmness of the waters is pictured by Wadsworth in the lines:

"Let
The swan on still St. Mary's lake
Float double, swan and shadow."

YAR'ROW. See JARROW.

YASKA. See NIRUKTA.

YATES, a co. in w. New York, bounded e. by Seneca lake; about 500 sq.m.; pop. '80, 21,987—19,289 of American birth. Iron ore is found. Co. seat, Penn Yan.

YATES, JOSEPH C., 1768-1837; b. N. Y., admitted to the bar, and practiced at Schenectady, of which he was mayor, 1798-1808. He served in the state senate, 1806-7, was a justice of the New York supreme court, 1808-22, and governor of New York, 1823-25. He was one of the founders of Union college. Yates co., N. Y., is named from him.

YATES, RICHARD, 1818-73; b. Ky.; graduated at Illinois college, and was called to the bar. He soon began to take an active part in public affairs, and after several terms in the Illinois legislature was elected to congress on the whig ticket and remained there,

1851-55. He was governor of the state of Illinois during the war of the rebellion, and rendered important service in raising troops. He was U. S. senator from Illinois, 1865-71. His natural abilities were recognized as great.

YATES, ROBERT, 1738-1801; b. N. Y.; studied law, was admitted to the bar, 1760, and practiced at Albany. He was a member of the provincial congress of 1776 and of the committee of public safety. In 1777 he was made a judge of the supreme court of New York and became chief justice in 1779. He was a member of the convention which framed the U. S. constitution, and his notes on the proceedings of that body were published posthumously.

YATES, WILLIAM, D.D., 1792-1845; b. England; studied at Bristol, became a missionary, and in 1815 was sent to India by the Baptist association. Here he remained until his death, with the exception of a trip to England and the United States in 1827. He translated the New Testament into Hindu, Bengalee, Hindustanee, and Sanskrit; the Old Testament in whole into Bengalee, and in part into the other tongues. He published a grammar of Sanskrit, 1820, and other philological works. Returning to England in 1845, he died on the Red sea.

YAVAPAI, a co. in extreme n.e. Arizona, bounded n. by Utah and e. by New Mexico; about 50,000 sq.m.; pop. '80, 5,013-3,757 of American birth. The region is noted for its precipitous and picturesque cañons of the Colorado Chiquito. Gold and silver are found. Co. seat, Prescott.

YAW, in the motion of a ship or boat, is the term for describing an irregular deviation in the course steered. A very chopping wind or sea *may* produce this effect, but the helmsman would usually have the credit of bad steering.

YAWL, a decked boat having two masts, on the first of which is a lugsail and top-sail; and on the aftermost, which rises almost from the stern-post, a driver or fore-and-aft sail. It is a very easily managed rig.

YAWNING may be either the simple result of deficient aëration, or may be brought on by the mere sight of the act in another person, and is a modification of the ordinary movements of respiration, in which the inspiration is deeper than usual, and is accompanied by a kind of spasmodic contraction of the muscles which depress the lower jaw, and by a great elevation of the ribs and to some degree of the shoulder-blades. "The purely involuntary character of the movement," says Dr. Carpenter, "is sometimes seen in a remarkable manner in cases of palsy, in which the patient cannot raise his shoulder by an effort of the will, but does so in the act of yawning. Nevertheless, this act may be performed by the will, though not completely; and it is one that is particularly excited by an involuntary tendency to imitation, as every one must have experienced who has ever been in company with a set of yawners."—*Principles of Human Physiology*, 8th ed., p. 280.

YAWS, known scientifically as *frambesia*, is a cutaneous eruption of a very peculiar nature, which commonly attacks negroes, but has been noticed in Europeans. The disease is preceded by languor and pain in the limbs, and shivering, succeeded by heat and restlessness, and is more severe in children than in adults. After a few weeks, the pure glossy-black color of the skin gives place to a dirty dull tint; and the patients often not only loathe the food, but take to eating coals, chalk, earth, etc. The skin is then covered for a few days with a white mealy scurf, as if it had been dusted with flour, after which pimples like pin-heads appear on the forehead, face, neck, groins, etc., which increase for a week or more, growing into crusted pustules, which enlarge until the base attains the size of a sixpence, or even a shilling. If the crust is removed, a foul sloughing sore is exposed. The pustules may, however, burst spontaneously, and discharge a thick viscid matter, which hardens to a scab on the surface. In the larger pustules this surface at length becomes elevated into a red granulated excrescence, not unlike a wild raspberry (*frambesia*), which is the true and characteristic yaw. In size it may vary from that of a pea to that of a mulberry, and in color it varies with the general health of the patient from a red to a pale white tint. It has very slight sensibility, and never properly suppurates, but discharges a glutinous fluid, which communicates the disease by inoculation. When the yaw has remained for some time, it diminishes in size, and as the pustule heals, is finally covered with skin, leaving little or no mark. When the disease seems to have reached its height, one pustule becomes much larger than any of the others, and instead of being elevated, is depressed. This is termed the master or mother yaw, and requires much care. When the mulberry-like excrescences appear on the soles of the feet, the resistance of the thick epidermis excites great pain. They are then termed by the negroes *tubber*, or crab-yaws. This disease is endemic among certain tribes of native Africans, and is common among the negroes of the West Indies and of North and South America. It is contagious, and cannot be communicated except by the actual contact of yaw-matter to the abraded skin, or by inoculation, which is sometimes effected by means of a large fly called the yaw-fly. The interval between the reception of the poison and the formation of the eruption varies from seven to ten weeks. The disease scarcely ever attacks the same individual more than once. "Yaws," says Dr. Craigie, in his learned work on *The Practice of Physic*, "are liable to be confounded with the secondary [tertiary?] or

cutaneous symptoms of syphilis, with sivvens,* with the Arabian leprosy, with radesyge, pellagra, and the red leprosy of Cayenne." Several writers of eminence regard yaws as the same with the disease described in Leviticus, chap xiii., as the Jewish leprosy, but the description of the symptoms there given is not sufficiently precise to furnish sufficient evidence regarding their identity. With regard to treatment, mercury does more harm than good, and all that can be done with advantage is to render the progress of the morbid processes as little painful as possible. The most important remedial agent is the warm bath; and blood-purifying drinks, such as decoction of sarsaparilla, etc., may be prescribed. The Africans have their own native remedies in the bark of trees called *yuffo* and *bullunda*, taken in infusion or decoction; and to destroy the mother-yaw they adopt the following barbarous process: Iron is boiled in lime-juice with a quantity of the common black ants and of Malaguetta pepper, and the liquid thus prepared is applied hot to the yaw.

YAZOO', a river of Mississippi, formed by the union of the Tallahatchee and Yalabusha, runs s. and s. by w. in a very serpentine course, in a deep, narrow, sluggish channel, between fertile cotton plantations, and empties into the Mississippi river, 12 m. above Vicksburg; it is 290 m. long, and navigable at all seasons.

YAZOO, a co. in w. Mississippi, bounded s. by Big Black river; 650 sq.m.: pop. '80, 33,846—33,524 of American birth, 25,348 colored. Co. seat, Yazoo City.

YAZOO FRAUD, a term commonly applied to the sale by the state of Georgia in 1795 of her western territory, now included in Alabama and Mississippi, to several land companies. The consideration was \$500,000. In 1789 a similar sale had been made, but owing to defective Indian titles was inoperative. The territory was described as extending from the Alabama and Coosa rivers to the Mississippi, and from the 35th to the 31st parallels of latitude. It was believed that the legislature had acted from corrupt motives. President Washington referred to the matter in a message to congress. The people of the state were indignant and excited, and a party was formed, led by senator James Jackson, which agitated for the repeal of the sale. This was brought about in 1796, and the records of the transaction were burned in the presence of the governor and legislature. The territory in question was ceded to the United States in 1802. In 1803 a commission was appointed by Jefferson under an act of congress to investigate the Yazoo claims. Madison, as chairman, recommended a compromise, but Georgia refused to compensate the claimants. Their claim was sustained in the U. S. supreme court, Marshall, C. J., holding that allegations of bribery of the legislature could not be entertained, and that purchasers from the land companies were innocent holders without notice. Accordingly in 1814 congress ordered the lands to be sold and \$5,000,000 to be appropriated for extinguishing the Yazoo claims.

YEADON, a t. of the West Riding of Yorkshire, England, 6 m. n.e. from Bradford. It stands on a hill, on the left side of the valley of the Aire. It has considerable woollen manufactures. Pop. '71, 5,246.

YEAR, a division of time containing a complete course of the seasons, and depending upon the revolution of the earth (q. v.) round the sun. Its duration was variously determined by the nations of antiquity; the earliest method being the conventional one of making it include a certain number of lunar months; the lunar month being, after the day, the first period of time which was fixed. Twelve lunar months, giving a year of 354 days, were first taken as a near approach to a course of the seasons. This, though a pretty close approximation to the true value of a year, was yet so incorrect (being defective by more than 11 days) that it was soon found to be necessary to intercalate these 11 days, in order to preserve the year in a constant relative position to the seasons. The intercalation was variously effected; thus, the Egyptians, who knew the year of 365 days previous to 1500 B.C., divided it into three seasons ("winter," "summer," and "the Nile," i.e., *the inundation of the Nile*) of four months each, made each month contain 30 days, and introduced five intercalary days at the end of the 12th month; the Greeks, who generally retained the lunar year of 354 days, added 3 months in the course of every eight years, giving an additional month to the third fifth, and eighth year of each cycle; the Romans also added additional days, but their system of intercalation was continually changed, not always for the better, till Julius Cæsar caused the adoption of the solar year. The Romans likewise abolished, in Asia, Egypt, and all the other countries under their sway, the old method of reckoning by lunar years, and compelled the adoption of the Julian calendar, according to which the year was assumed to contain 365 days 6 hours. The substitution of the Gregorian calendar in the 16th c. introduced for the average length of the solar year, 365 days 5 hours 49 minutes, which differs only by a few seconds from its true value; and this small annual error, as well as the excess of

* As sivvens or sibbens, and radesyge, are diseases not much known to the general public, and not noticed in this work, we may mention that sibbens is a tubercular affection of the skin, often extending to the deeper tissues, very infectious, and said to be endemic in Dumfriesshire, Ayrshire, and Galloway, first described about a century ago by Dr. Ebenezer Gilchrist; while the radesyge, spedalsked, spedalska, liktraa, northern leprosy, or marsh sickness, is endemic in various parts of Scandinavia, consisting in its fully developed form of "an eruption of pimples, scales, patches, and tubercular pustules on the skin, terminating in pusiform discharge, with or without ulceration."—Craigie, *op. cit.*, vol. i. p. 690.

the true year over the year of 365 days, is compensated for by means of a succession of *leap-years* (q.v.).

The time at which the year began varied much among different nations. The Carthaginians, Egyptians, Persians, Syrians, and other eastern peoples commenced their year at the autumnal equinox, at which time the civil year of the Jews also began, though their sacred year was reckoned from the vernal equinox. The commencement of the Greek year was at the winter solstice before Meton's time, and was then changed to the summer solstice. The Romans were the first to adopt the 1st day of January as the first of the year, but their example was not followed by subsequent European nations for some time. In France, the commencement was Mar. 1 under the Merovingians, Mar. 25 under the Carolingians, Easter under the Capetians, and Jan. 1 from 1564. The ecclesiastical year in Europe generally commenced on Mar. 25 (see DATE). The ancient northern nations reckoned their year from the winter solstice; the Russians, till Peter the great's time, from Sept. 1, and the same reckoning, known as the Byzantine era, was in use in the eastern empire. Of necessity, the commencement of the year among Mohammedan nations has no fixed position in relation to the sun's course or the seasons, it being invariably a lunar year. In astronomy there are several kinds of years depending upon the various configurations of the earth in its orbit, and consequently varying in length. First, there is the *tropical*, or as it is sometimes incorrectly called *solar* year, which, from its being recognized in legislation and history, and commonly applied in the measure of time, has also received the name of *civil* year. This year is defined as the time which elapses from the sun's appearance on one of the tropics to its return to the same, and has a mean length of 365.2422414 mean solar days, or 365 days 5 hours 48 minutes 49.7 seconds (see PRECESSION). Next is the *sidereal* year, which is the period required by the sun to move from a given star to the same star again, and this year, affected as it is by nutation (q.v.) only, is one of the most invariable quantities which nature presents us with, and has a mean value of 365.2563612 mean solar days, or 365 days 6 hours 9 minutes 9.6 seconds. The time which elapses between the earth's arrival at its perihelion (q.v.) and its return to the same position, is known as the *anomalous* year, and is equivalent to 365.2595981 mean solar days, or 365 days 6 hours 13 minutes 49.3 seconds. The sidereal and anomalous years have a merely astronomical importance.

YEAR AND A DAY, a period of time much used in law as a limit to privileges and perils. For example, if the owner of an estray challenged it within a year and a day he could recover it; if a wounded person die within that time his death may be accounted murder; when a judgment is reversed a new action may be commenced within the limit; if the execution of a judgment be delayed beyond the limit it cannot be issued without a renewal of legal process; so in case of prize, or of goods saved if no claim be entered within the limit the condemnation to the parties in possession follows as a matter of course. The same period was recognized in the civil law, book of feuds, and the laws of the Lombards. And the year was not always limited to a precise calendar year. With the Gothic nations it meant a year and six weeks.

YEAST. In the process of fermentation of saccharine fluids containing albuminous matter, as in brewing or wine-making, the originally clear fluid becomes turbid, carbonic acid is evolved, and the substance causing the turbidity gradually separates in a graying foaming mass of a bitter taste and an acid reaction. This is yeast; and on examining it under the microscope, it is found essentially to consist of aggregations of small oval cells of a vegetable nature, known as the yeast-cells, yeast-plant, or *toruli cerevisiæ* (q.v.). Yeast, as is well known, has the property of setting up fermentation in saccharine solutions; and beer-yeast, the kind with which we are specially acquainted, possesses, according to prof. Miller, this power in the highest degree, as may be shown by dissolving 4 parts of pure cane-sugar in 20 parts of water, and adding 1 part of fresh yeast; if this mixture be exposed to a temperature of about 80°, in less than an hour fermentation will have commenced. The investigations of Mitscherlich have led chemists to distinguish two varieties of yeast—viz., the *ober-hefe*, or surface-yeast, and the *unter-hefe*, or sediment-yeast, the former collecting on the surface of the fermenting fluid, and the latter forming a sediment. Surface-yeast is propagated by buds (see TORULA CEREVISIÆ) and sediment-yeast by spores; and each variety produces specific results upon the fermenting fluid. The fermentation induced by the surface-yeast is rapid and irregular; while that produced by the sediment-yeast is slow and quiet. The surface-yeast is formed when the saccharine fluid ferments at a temperature of from 65° to 77°; while the sediment-yeast is chiefly produced when fermentation takes place at the lower temperature of from 32° to 45°. In their chemical relations, the two varieties present no apparent difference. On treating yeast with a solution of potash, a cellulose-like substance remains, while an albuminate is dissolved. The action of yeast is destroyed by exposing it to a temperature of 212°, by alcohol, by the strong mineral acids, chlorine, iodine, and bromine, oxide of manganese, creosote, etc.; on the other hand, it may be dried at a low temperature, or by pressure, and may be preserved in this state without losing its activity. The part which the globules of yeast play in exciting the conversion of sugar into alcohol and carbonic acid, is very obscure; but an experiment of Mitscherlich seems to show that the sugar ferments only in those points which are in actual contact with the globules. Pasteur's experiments render it probable

that the process of fermentation is connected with the assimilation of the sugar by the yeast-plant during the development of the yeast-globules, or, in other words, that "the essential condition of fermentation is the conversion of albuminoid matter into organized globules."

According to Mitscherlich's analysis, the cells of ordinary washed yeast in a condition to excite fermentation contain (the ashes being deducted): carbon, 47.0; hydrogen, 6.6; nitrogen, 10.0; sulphur, 0.6; oxygen, 35.8; while spent yeast (after fermentation had ceased) contained only 5 of nitrogen. The inorganic matter amounted to 7.3 per cent of the dried yeast, and consisted entirely of phosphates.

The economic uses of yeast in bread-making, brewing, etc., are noticed in other articles. Beer-yeast (*cerevisia fermentum*) is an article of the British Pharmacopœia. It is employed as a stimulant in the advanced stages of low fevers, and is especially serviceable in cases where, in consequence of inflammatory symptoms, wine is inadmissible. Nellan has found it of great service in intense tympanitis following parturition. The dose is two tablespoonfuls every three hours, and it may be given in camphor mixture or peppermint water. Yeast-poultice forms an excellent stimulating application to foul and irritable sores. It is composed as follows: Take of yeast, six fluid ounces; flour, fourteen ounces; water heated to 100°, six fluid ounces. Mix the yeast with the water, and stir in the flour. Place the mass near the fire till it rises. This poultice should be renewed every six or eight hours. Its special efficacy depends upon the carbonic acid gas which it evolves.

If surface-yeast or under-yeast be collected and placed on a cloth to drain, and then pressed until nearly dry, it can be kept with care for several months, and in that state is what is called GERMAN YEAST, for which a large trade has sprung up within the last few years; the imports to Britain from the continent having amounted, in the year ending Dec. 31, 1875, to 163,321 cwt., or about 8,176 tons. It is chiefly imported from Holland and Hamburg, and is obtained mostly from the great continental distilleries. Nearly the whole of this large quantity is consumed by the bakers. PATENT YEAST is exactly similar, but is raised from a wort made purposely from malt and hops. ARTIFICIAL YEAST is a dough of wheat or other flour, mixed with a small quantity of common yeast, and made into small cakes, which are dried. If kept free from damp, it long retains its fermentive power.

YEDO, or YEDDO. See TOKIO, *ante*.

YEISK. See JEISK, *ante*.

YEKATERINBURG. See EKATERINBURG.

YEKATERINOSLAV. See EKATERINOSLAV, *ante*.

YELATOM. See JELATOM.

YELETZ'. See JELETZ, *ante*.

YELL, a co. in W. Arkansas, bounded n. by the Arkansas river; 936 sq. m.; pop. '80, 13,852—13,735 of American birth, 1110 colored. Co. seat, Danville.

YELL, one of the Shetland islands (q.v.), and, after Unst, the farthest n. of that group, is separated from Mainland by Yell sound, and from Unst by Blue Mull sound. It is 17 m. in length, 5½ m. in average breadth. Area, 94 sq. m.; pop. '71, 2,732. The w. coast is rocky and precipitous, but on the whole the surface is tame, and consists largely of moorlands—the greatest elevations being no more than 400 ft. above sea-level. Agriculture is in an unusually backward state, and, though the surrounding seas are generally stormy, fishing is the chief employment.

YELLOW BERRIES. See FRENCH BERRIES.

YELLOW-BIRDS. *Chrysomitris tristis*, a bird of the finch family (*fringillidae*), a native of North America, where it is very widely distributed. It is rather more than 5 in. in entire length; the male in summer plumage of a bright yellow color, with black crown, wings, and tail, the upper and under tail-coverts white. The female is yellowish brown above, and ashy brown below, and the male assumes a very similar plumage in winter. Yellow-birds are often seen in large numbers, feeding on seeds of thistles and other plants, and seldom alighting on the ground. The nest is made of lichens fastened together with saliva, and lined with soft substances. The song of the yellow-bird is very pleasing; and it is a sprightly and attractive cage-bird, easily tamed, and capable of being taught tricks. Several allied species are found in the western parts of America.

YELLOW COLORS. The yellow pigments employed by painters are. 1. The varieties of chrome prepared from chromate of lead. See CHROMIUM. 2. Several colors technically called *pinks*—as *brown pink*, prepared as a lake from a decoction of French berries and fustic; and *English pink* and *Dutch pink*, both lakes, prepared by different processes from French or yellow berries and turmeric. 3. *Naples yellow*, a mixture of metallic antimony, red-lead, and oxide of zinc calcined, added to a small quantity of lime, then fused, and afterwards ground to powder. 4. *King's yellow* is a tersulphuret of arsenic. 5. *Patent yellow* consists of 28 parts of chloride of lead and 27 parts of carbonate of lead well mixed in powder, and then fused together. 6. *Weld yellow* is prepared from a decoction of weld (*reseda luteola*), or dyer's weed with alum, and is, in fact,

another yellow lake. It is much used in paper-staining. 7. *Gamboge*, which constitutes the chief yellow color used in water-color painting.

YELLOW-EYED GRASS, a genus of grasses, *xyris*, of the order *xyridaceæ*, or yellow-eyed grass family, the members of which are rush-like herbs with equitant leaves, sheathing the base of a naked scape, which is terminated by a head of triandrous flowers. The three-valved, and usually one-celled pod, contains several or many orthotrophic seeds with a minute embryo at the apex. More than 50 species of *xyris* have been described, of which 15 are found in the northern United States. *X. flexuosa* has a slender scape from 10 to 16 in. high, slightly flattened at the summit, smooth, and much longer than the narrow linear leaves. Grows on sandy bogs all along the Atlantic coast from Massachusetts to Virginia, and also in some of the central western states. *X. tortu* grows on the New Jersey pine barrens and in the southern states in dry sand. Scape nearly round, with one sharp edge, and slender, from 9 to 20 in. high, springing from a bulbous base, and in time becoming spirally twisted with the linear-filiform rigid leaves; head ovoid, becoming spindle-shaped and acute, from one-half to three-quarters of an inch long; sepals longer than the bract, and lateral sepals winged on the keel and fringed above the middle. In the same localities is found *X. fimbriata*, having an angled scape, two-edged above, 2 ft. high, rather longer than the linear sword-shaped leaves, the base not bulbous; head oblong, from one-half to nearly an inch long. *X. Caroliniana* is found in sandy swamps from Rhode Island to Virginia and southward, along the coast; scape rather flat, from 1 to 2 ft. high.

YELLOW FEVER is a disease endemic in low districts near the sea, but under certain circumstances sporadic in other places, never appearing beyond 48° of n. lat., nor without a temperature of at least 72° F., nor above the elevation of 2,500 ft. above the level of the sea, depending in part on causes not yet known, but in circumstances favorable to its production, capable of being propagated by contagion. It usually commences suddenly (generally in the night or early morning) with a sense of coldness, a rigor, or actual shivering, followed by vascular reaction, as shown by the heat and dryness of the skin, headache, especially over the eyes, and pain of the eyeballs, which are suffused, and have a strange drunk-like aspect. The limbs and loins are painful; the tongue is loaded, and its edges are red. There is a peculiar and characteristic flush or suffusion of the face, occupying a zone of about an inch above and below the eyes. Nausea, gastric uneasiness, and a tendency to vomit soon supervene. These symptoms may gradually lessen, and the patient will then regain his ordinary health in 24 or 36 hours; but if the symptoms persist, they soon become more aggravated, and the stomach ejects at first a clear fluid, which soon becomes of a dirty-brown tint, and is finally succeeded by the true *black vomit*. A yellow tint on the conjunctiva is observed, which extends to the skin of the face; and as the disease advances, the whole body becomes of a yellow color, varying in intensity from a pale lemon to a deep orange tint. The anxious countenance indicates the distress of the patient, who appears to be agitated by fearful apprehensions or incipient delirium. The skin feels constricted, and is of a pungent heat. The bowels are constipated, and the red, clean, and tremulous state of the tongue indicates the presence of intestinal irritation, and consequently the increase of danger. The urine and other excretions are more or less suppressed. Eructations, hiccoughing, and vomiting increase the distress and weakness. The disease in fatal cases usually terminates on the second or third day. The above train of symptoms is by no means constant. Sometimes, when everything seems favorable, black vomit suddenly appears, and the patient immediately succumbs. In other cases, patients experience no symptoms except severe pains in the legs and suppression of urine, and die without taking to their beds. In all cases terminating fatally, albumen appears in the urine on the second or third day. In females, the catamenial discharge is sure to appear, whether due or not. The discharges from the bowels, toward the close of the disease, may be black or dark green, and these dark evacuations are succeeded by what is termed the "caddy-stool," resembling dark sandy mud. As yellow fever is not a disease of this country, we shall not enter more fully into its symptoms. According to Dr. Jackson, who has written an excellent treatise on this disease, the usual course of yellow fever in its most concentrated form consists of 12 hours of forming period, 36 or 38 of formed or proper fever, and 24 or 36 of declining or concluding period. When the symptoms are less intense, the patient may survive to the 14th day. In the milder modifications of this disease, the morbid symptoms are prolonged to a considerable extent. Death may occur at any period of the disease, and the mode in which it occurs is by syncope (fainting), uræmia (or poisoning of the blood by the accumulation of urea), apoplexy, or asphyxia or suffocation. When the black vomit is plentiful, and the urine free, the intelligence remains unaffected, but the skin becomes cold and damp, the pulse small, and finally imperceptible at the wrist, and death ensues from gradual exhaustion and syncope. When the black vomit is scanty, and the urine suppressed, the poisoned blood acts upon the brain, and the patient exhibits wild delirium, followed by coma, convulsions, and death. The ratio of deaths to cases in the disease is always very high. From Tulloch's statistical reports on the diseases of soldiers, it appears that in the windward and leeward command, the ratio was 1 to 2½ (or 3 in every 7 cases died), in the

Jamaica command it was 1 to 1½ (or 3 in every 4 cases died), while in Gibraltar it was 1 to 1½ (or 3 in every 5 cases died).

There are great differences of opinion as to the proper treatment of this disease. Dr. Blair, one of the highest authorities on yellow fever, holds that the disease may be cut short or aborted by prescribing "20 grains of calomel added to 24 grains of quinine, afterward followed by two drams of carbonate of magnesia, and two ounces of sulphate of magnesia in eight ounces of peppermint water." These abortive doses were repeated at intervals of four or six hours, one dose being generally efficient, but four have been given before the quinine induced its special symptoms of cinchonism. Many physicians who have had much experience of this disease, have no belief in the abortive treatment; and some treat their cases with antiphlogistic or lowering remedies, and others with stimulants. It is probable that there is no one mode of treatment suitable for all cases, and that each should be treated according to its special symptoms. The extreme heat of the surface (a temperature of 107° has been observed in the arm-pit) may be relieved by the frequent application of the wet sheet; cupping or leeches often relieve the head-symptoms; and a blister to the gastric region may relieve the irritation of the stomach. If there is no suppression of urine, and if that fluid is free from albumen, morphia is of great service, but it must be given with great caution. The food should be of the mildest form, such as chicken-tea, arrow-root, sago, and barley-water, and these should be taken frequently in very small doses, in consequence of the state of the stomach. Similarly, with regard to all drinks, which are most likely to be retained if sucked through a tube or given by teaspoonfuls. Tea usually disagrees, but cold infusion of oatmeal, and very dilute brandy and water, are usually relished. Our highest authority on tropical diseases, sir J. Ranauld Martin, states that, whenever the disease breaks out, "the most speedy means of prevention [of its spreading] in respect to towns and garrisons, will always be found in the removal of both the sick and the healthy to a locality where the temperature is sufficiently low, such as a neighboring range, or dry ventilated ground." In all ships on service on the w. coast of Africa and other unhealthy stations, the following rules (which we borrow from Dr. Aitken's *Handbook of the Science and Practice of Medicine*) should be strictly attended to. A prophylactic dose of quinine (five grains) should be administered to the men daily (a precaution that should be taken in all malarious regions, independently of yellow fever). Whenever the fever appears on board, the ship should at once put out to sea, and should proceed to the coolest atmosphere within reach. The most immediate measures of prevention should be, to obviate direct solar exposure, to prevent fatigue, and to check any excesses in the use of spirits. Seamen should be kept as remote from unhealthy coasts as is consistent with duty, anchoring every evening a few miles from the shore if possible. Duties in boats should as much as possible be conducted during the mornings and evenings, the noon-day heats and the deadly nocturnal emanations being to be equally avoided. When men are landed, they should be encamped on high and dry ground. Meals should be regularly served and carefully cooked, and coffee should be given early in the morning, and after unusual fatigue or exposure, and no work should be commenced till the coffee has been taken. Holds of ships should not be cleansed on the spots where the fever has originated, or during its prevalence, but the process should be deferred till the vessel is in a colder latitude. Lastly, green wood should not be placed on board ship in hot climates, but the wood should be barked and partly charred.

Dr. Craigie, in his learned *Practice of Physic*, gives the following extensive list of synonyms of yellow fever: "*Febris flama, Typhus ceterodes, Sauvages and Cullen; La Maladie de Siam, La Fièvre Matelotte, Vomito Prieto, Chapetonada, Fièvre Amarilla Hispanorum et Hispano-Americanorum*; new distemper of 1691; Keudal's fever, pestilential fever, bilious fever of Gamble; endemical causus or burning fever of Moseley; malignant pestilential fever of Chisholm; remittent and bilious remittent of Hunter; concentrated endemic fever of Jackson; tropical continued fever of Lempriere." We shall conclude with a short notice of the history of this disorder. Long before the arrival of Cortez in Mexico, an extremely fatal epidemic disease used to prevail among the native Mexicans. Epidemics of special severity occurred in 1545, 1576, 1736-37, and 1761-62. Although Humboldt thinks that the elevation of the table-land of Mexico (7,200 to 7,800 ft. above the level of the sea) is sufficient to exclude any idea of the identity of this disease, known as *Mtlatzahuatl*, with yellow fever, there can be little doubt, from the similarity of the symptoms, that the two diseases are really the same. The Europeans visiting the shores of America soon became painfully familiar with the disease; and it is almost certain that "the plague" which so often destroyed the English and Spanish troops at the end of the 15th and the beginning of the 16th centuries was in reality yellow fever. A disease bearing the character of yellow fever appeared in 1618 among the Indians in certain parts of Massachusetts, and prevailed with much severity till 1623, and it committed great havoc among the emigrants to Virginia. When the expedition against Hispaniola in 1655, under Venables, returned to Jamaica, they met there "an enemy (the plague) more severe than the Spaniards, which in a little time reduced the army, originally 7,000, to fewer than 2,000 men." There can be little doubt that this plague was yellow fever. In 1691 it was very fatal in Barbadoes, where it was known as the *new distemper*. From about this date yellow fever has been endemic in the West

Indies. It was unknown at Carthage and along the coast till 1729, when it committed dreadful havoc; the Spanish galleons never remaining any time without interring one-half or at least one-third of their men. In 1740 it first appeared at Guayaquil, since which time it has often occurred; and in all the towns on the coast of the American continent and islands between 45° n. lat. and 10° s. lat. it appeared in proportion as Europeans began to visit them. "In this manner," says Dr. Craigie, "Vera Cruz, Cumana, Havana, Acapulco, and La Guayra have successively become its endemial abodes; and its appearance in these towns is as uniform and certain as the arrival of the sun at the tropic of Cancer. Of these places Vera Cruz and Havana may be regarded as the nursery of yellow fever; and from the month of March to that of September or October the disease rages like a pestilence among the recently arrived Europeans, and those natives who descend from the elevated table-lands of the interior." Until the year 1793 the disease was regarded as having a spontaneous origin, and being due to tropical peculiarities operating on European and unseasoned constitutions; but that year the doctrine of infection suddenly started. In that year the disease appeared with great virulence in the island of Grenada, and rapidly spread over the Antilles to Philadelphia and many parts of the state of Pennsylvania, to Massachusetts, New York, Caroline co., Md., Alexandria in Va., several counties in North Carolina, and Caracas in Venezuela. This outbreak was preceded by a few days by the arrival of a vessel from Bulam, on the w. African coast, at a harbor in St. Grenada, in which vessel, when stationed off Bulam, fever had prevailed about five months before to a great and fatal extent. This disease was at the time termed the Bulam fever, but soon turned out to be ordinary yellow fever. Since 1763 yellow fever has very often appeared as an epidemic in the West India islands and various parts of the American states, and has even been endemic in various parts of the s. of Europe, especially Gibraltar and Malaga. From the testimony of many medical writers it is certain that a disease essentially identical with yellow fever prevails endemically along the w. coast of Africa, at Senegal, Sierra Leone, Cape Coast Castle, and the island of Fernando Po. Fortunately for this country, this fell disease, which has repeatedly been brought to our shores (Swansea, Southampton, etc.), is at once nipped out by our climatic conditions. When, in 1866, it was imported into Swansea, Dr. Buchanan, who was at once sent down by the government to watch the disease, and take the necessary measures to prevent it from spreading, recorded 12 instances in which, with filth, bad ventilation, and every other condition favoring the fever, it failed in every case to spread beyond the original victim. Altogether there were 29 cases, of which 15 were fatal.

The most terrible recent visitation of yellow fever scourged portions of the lower Mississippi valley in the autumn of 1878. In New Orleans and Memphis alone the deaths exceeded 5,000.

YELLOW FEVER (*ante*). The recent investigations chiefly carried on by the American public health association indicate that yellow fever is a highly infectious disease, but not contagious, in the sense that small-pox is—one person taking it from another by breathing the same atmosphere. If the person sick with the disease wears garments brought from the infected locality, such materials may communicate the disease. The following facts submitted in a paper by Dr. D. W. Hand, surgeon U. S. army, at the annual meeting of the American public health association at Richmond, Va., in Nov., 1878, furnish strong evidence in favor of this view. In Sept., 1864, a violent epidemic of yellow fever broke out at New Berne, N. C. An occasional case had been seen there before, but no epidemic since 1779, when a large number of citizens died of it. New Berne was under martial law in 1864, and an examination of records shows that no vessel arrived there from any port s. of Beaufort, N. C., nor from any infected port, during the summer of that year, and no case occurred at Wilmington till near the middle of October. New Berne is situated on a low, sandy plain at the junction of the Neuse and Trent rivers, and is almost surrounded by swamps and marshes. In 1864 tight board fences surrounded nearly all the gardens and back-yards, and the privies and outhouses had been neglected. The drainage of the town was entirely on the surface, which being but little above the level of the river, made it defective. The summer was hot and wet, and the whole town was damp and moldy. There is very little ebb and flow of tide, but a succession of strong s.w. winds in August drove the water out, and for many days the tide was extremely low, leaving extensive mud flats exposed to the rays of the sun. At the same time a new embankment was made by the military authorities across the Neuse river-front, and large quantities of filth-saturated soil were exposed. Previous to this several small docks on both river-fronts had been filled up, partly with stable manure and street cleanings, for the purpose of extending the wharves. Between two of these was a row of old frame buildings used as commissary warehouses, several being built on piles, and under them the water had flowed and formed a cavern for which no drainage was provided. Dead rats and other vermin and filth made the pool in this cavern exceedingly poisonous. The above conditions, in the opinion of surgeon Hand, produced the peculiar germs of yellow fever. Upon noticing that the first and worst cases came from this point, an investigation was made, during which many workmen were made sick by the overpowering effluvia. Gradually the disease spread through the town, and by Nov. 1, nearly every inhabitant had

an attack. The negroes generally had the disease mildly, as well as the children, but among the aged and persons recently from the north it was generally fatal. Among the attending physicians the fatality was very great. Of 23 medical officers of all grades, 21 had the fever and 11 died. Many sick were sent to other places, as Moorhead City, Beaufort, Hatteras, and Roanoke island, and of these many died, *but the disease did not extend to others*. At Moorhead City the patients removed from the hospital at New Berne were placed indiscriminately in the wards of a large general hospital, and citizens of New Berne were received at the hotel. Among them 21 soldiers and 34 citizens died of yellow fever, but the disease extended to none except they had visited New Berne or Beaufort. At other points the same immunity of non-exposed persons was noticed. Other facts, such as that brought forward by Dr. Toner, of Washington, that yellow fever has never been propagated within the limits of the United States at a greater altitude than 500 ft., indicate that the generation of the disease germs from filth requires certain geographical and meteorological conditions which still demand study. There is diversity of opinion as to treatment, but all concur in removal to a pure atmosphere, and thorough cleanliness.

YELLOW-HAMMER, or **YELLOW BUNTING**, *Emberiza citrinella*, a species of bunting (q.v.), which is one of the most common of small birds in Britain, distributed over all parts of the country, and is common also in most parts of the continent of Europe from Norway and Sweden to the Mediterranean. It is about seven inches in entire length, and the male is a bird of brilliant plumage, although there is something in the short thick form of the bird, and in the tints and distribution of its plumage, which prevents it from being greatly admired for beauty. It is, perhaps, also the less regarded because it is so common; and in many parts of Britain there is a prejudice against it, so that boys who would think it wrong to rob any other bird's nest, esteem it a kind of duty to rob that of the yellow-hammer. In the summer plumage of the male, the head, cheeks, ear-coverts, and nape of the neck are bright lemon yellow, with a few dusky black patches; the upper part of the back and wings are reddish brown, tinged with yellow; the wing-primitives are dusky black, with narrow external edges of bright yellow; the secondaries, tertials, and wing-coverts dusky black, broadly margined with rich chestnut brown; the upper tail-coverts reddish chestnut, edged with yellow; the tail-feathers dusky black; the central pair edged with chestnut, and tinged with yellow; the chin, throat, and whole under surface, bright lemon yellow, clouded on the breast and flanks with reddish brown. The tail is slightly forked, and is shorter than that of the common bunting. The knob in the palate is also less conspicuous. The female has much less yellow about the head than the male, and her plumage is altogether much less vivid. The yellow-hammer frequents hedges and low trees, and is often to be seen, especially in winter, in the vicinity of houses, in flocks, with sparrows, chaffinches, etc. It generally makes its nest on the ground, under shelter of a bush or a tuft of grass, forming it of moss, roots, and hair. The song of the male is very sweet, and consists of few notes, which have been jocularly set to music with the words "*A little bit of bread, but no-o cheese.*" He is remarkably attentive to his mate, and takes his turn in incubation. In Italy great numbers of yellow-hammers are caught, and fattened like ortolans for the table. It is a curious and noteworthy circumstance that this bird is rare in insular situations; in the islands of the Mediterranean, as well as the Orkneys. The name Yellow hammer is a corruption of yellow-ammer; *ammer*, in German, signifying bunting. In Scotland, the yellow-hammer is known as the yoldrin or yite.

YELLOW-LEGS, the *gambetta floripes* (Bonaparte), a North American snipe, inhabiting the Atlantic coast of the United States. It is about 10 in. long from the tip of the bill to the end of the tail, with wings about 6 in. long. It is a delicious game bird. *G. melanoleuca* (Bonap.) is larger, being 14 in. long, wing 8 in., but similar in appearance, with ashy color above, under parts whitish, with transverse spots and stripes on breast and sides.

YELLOW MEDICINE, a co. in s.w. Minnesota; 792 sq.m.; pop. '80, 5,884—3,343 of American birth. Co. seat, Granite Falls.

YELLOW RIVER. See HWANG-HO.

YELLOW SEA. See WHANG-HAI.

YELLOWSTONE, a river of the United States; rises in a beautiful lake of the same name high up in the Rocky mountains, and receiving numerous branches from the s., flows north-easterly through the territory of Montana, and empties into the Missouri river, in the n.w. part of Dakota territory, lat. 48° 5' n., long. 104° west. It is 800 yds. wide at its mouth, 1060 m. long, and navigable 700 or 800 miles.

The region of the Yellowstone and its source was for the first time explored by parties from the United States in 1870-71, and seems to be one of the most wonderful spots in the earth. Making their way up the river through the grand scenery of the Rocky mountains, the explorers came to a district of a square mile in area, filled with hot springs in active operation, which cover the hillsides with snowy white deposit like a frozen cascade. Three or four miles around were occupied by springs which have ceased to flow. They are about 6,000 ft. above the sea, and are already resorted to by invalids. This was but the beginning of the wonders. Next they came to a terrific rift,

2,000 ft. in depth, with a river rolling in its deeps, "a grand, gloomy, terrible place." At the head of this cañon are the Tower falls, with a sheer descent of 400 ft. The Grand cañon, however throws this into the shade. This fearful abyss is 3,000 ft. in perpendicular height, and to one looking up from the bottom, stars are visible in broad daylight. The ravine is full of hot springs of sulphur, sulphate of copper, alum, steam jets in endless variety, some of most peculiar form. The grandeur of the cañon is at once heightened and diversified by the Upper and Lower falls; the latter one unbroken symmetrical expanse, 350 ft. in height. Between this fall and the lake lies a region full of boiling springs and craters, with two hills 300 ft. high, formed wholly of the sinter thrown from the springs. Further on is a valley containing about 1500 geysers, some throwing up immense columns of water to the height of more than 200 feet. The beautiful lake from which the river issues is about 300 sq.m. in area, and is situated 7,427 ft. above the level of the sea. In 1872 the region at the source of the Yellowstone, 65 m. long by 55 m. broad, including the Grand cañon and the lake, was reserved by congress from occupancy, and set apart as a "public park or pleasuring-ground for the benefit and enjoyment of the people."

YELLOWSTONE NATIONAL PARK. See NATIONAL PARKS.

YELLOW-THROAT, a species of insessorial birds, the *gothlypis trichas* of North America, more particularly called the Maryland yellow-throat. It belongs to the family *sytlecolide*. It is $5\frac{1}{2}$ in. long, with a wing $2\frac{1}{2}$ in.; the male has a black band on the forehead, cheeks, and ear-coverts; the female is without the band. Both have the throat and breast yellow. Its nest is made upon the ground, in which it lays from four to six white, light-brown-spotted eggs.

YEMEN, in a wide sense, includes the whole s. and s.w. of Arabia; but, more strictly, is the name of only the south-western corner of the peninsula, bounded on the n. by Hedjaz and Nedjed; and on the e. by Hadramaut and the desert. It was known to the ancients as *Arabia Felix* (*Felix* being a mistranslation on the part of Ptolemy of *Yemen*, which does not mean "happy," but the land to the "right" of Mecca), and they obtained from it much frankincense, myrrh, and other costly balsamic substances, in which it abounds more than any other part of the world; they obtained also from its ports the products of India, and other eastern regions, with which its inhabitants maintained a constant trade. The history of Yemen reaches back to the highest antiquity. The Joktanides, descendants of Joktan or Kahtan, are its first possessors of whom we have any record; and from them it seems to have passed, about 2400 B.C., into the hands of the Himyarites, or Homerites. The Himyarite states and cities of Saba, Thaphar, and Athana or Aden, attained at an early period a high degree of prosperity, carrying on a great commerce both by sea and land, and they extended their dominion over a large part of Asia and the n.w. of Africa. See SABÆANS and ADEN. The persecution of the Christians by the last Himyarite princes led to the overthrow of the Himyarite power by the Abyssinians, 529 A.D. From this date till 601 Yemen was ruled by Abyssinian governors; then for a short time by the Persians, under Khosru (*Chosroes*) II. The followers of Mohammed did not succeed in subduing Yemen till they had for a considerable time been masters of the rest of Arabia. Under all the califs, and even under Saladin, Himyarite princes retained a partial independence, which they reacquired when the Turks, who conquered the country in the 16th c., were expelled in the century following. For more than two centuries afterward, the country remained under the dominion of a number of Himyarite princes or sheiks, the most powerful of them being for a time the Imám of Sanáa (q.v.). In 1871-73 it was reconquered by Turkey.

The people of Yemen differ considerably in physical characteristics, dress, and manners from the inhabitants of the other parts of Arabia, and their language gives evidence of a different origin. See SABÆANS.

Our geographical knowledge of Yemen has been much increased by recent explorations, and charts of its coasts have been laid down by officers in the service of the East India company. Throughout the whole length of the country, at a distance of from 10 to 30 m. from the coast, a chain of mountains extends, between which and the sea is a tract of low ground, the *Tehama*, generally sandy and desolate, but in some places very fertile, and clothed with tropical vegetation. Inland from the mountain chain is a fertile table-land, at a general elevation of about 4,000 ft., yielding the productions of warm temperate rather than of tropical regions. Some of the mountains rise to a height of about 8,000 feet. The slopes even of the more lofty mountains are covered with luxuriant forests, and the mountain valleys are of unsurpassed fertility. The principal exports are coffee, dates, senna, gums and gum-resins, wax, ivory, and goat-skin morocco. Some grain is also exported. There are no rivers; but good harbors are formed in some places by natural openings in the coral reefs which line the coast. The principal ports are Mocha (q.v.), famous for the coffee which it exports; Abou Arish, or Gasim; Hodeida; Shehr; and Aden (q.v.), which is now in the hands of the British. Sanaa, the capital, or nominal capital, is situated on the table-land. Damar, Taas, Loheia, Beit-el-Fakih, and Zebeed are among the other principal towns.

YENIKA LÉ STRAIT, sometimes also called **STRAIT OF KERTCH** connects the sea of Azov with the Black sea, forming a sea-passage between the Crimea on the w. and the Caucasus on the east. It is over 20 m. in length, and at its narrowest is less than 2 m.,

and so shallow and interrupted by shoals, that cautious sailing and steering are necessary even for small steamers.

YENISEI, one of the largest rivers of Siberia, formed by the junction of the Oulou-Keme and the Bey-Keme, which rise in the mountains on the southern border of Siberia. It flows n. through the center of Siberia into the Arctic ocean, forming at its mouth a long estuary. In the earlier part of its course it is interrupted by falls and rapids; but afterward flows through a great plain or steppe, receiving many tributaries, of which the principal are the Upper Tunguska or Angara, from lake Baikal; the Middle and the Lower Tunguska. The Yenisei is 3,400 m. long, and is traversed by steamers. Repeated voyages since 1875 have proved that it is possible during part of the summer for vessels from Europe to sail direct to the mouth of the Yenisei, and to carry back the varied produce of the immense basin drained by it.

YENISEISK, a t. in the government of the same name in Siberia, on the Yenisei. Pop. '67, 6,644. Yeniseisk is an important trading center, and has a great annual fair, the chief articles of trade being grain, fish, salt, spirits, and furs. It is 3 m. in circumference, and has a custom-house and arsenal.

YENISEISK, that part of Asiatic Russia which lies between long. 80° and 107° e. on both sides of the Yenisei river; 958,042 sq.m.; pop. 350,848. The northern part is a frozen swamp, and the plain which inclines from the mountains to the ocean is inhabited by a few tribes of hunters. The southern part is mountainous and abounds in forests and the precious metals. Capital, Yeniseisk.

YEO'MAN (Ang.-Sax. *gemen*, common), a term which seems, in early English history, to have been applied to a common menial servant, but after the 15th c. came to denote a class of small freeholders, forming the next grade below gentlemen. The term yeoman is sometimes considered identical with the forty-shillings freeholder, possessed of the elective franchise.

YEO'MANRY, a volunteer force of cavalry in Great Britain, numbering in 1878, 14,830 of all ranks, and costing the country annually about £80,000. It was formed during the wars of the French revolution, and then comprised infantry as well as cavalry; but the whole of the infantry corps, and many of the cavalry, were disbanded after the peace of 1814. The organization of the corps is by counties, under the lords-lieutenant. The men provide their own horses and uniform; in consideration of which they receive annually a clothing and contingent allowance of £2 a man, are exempt from taxation in respect to the horses employed on yeomanry duty, and draw during the annual training 2s. a day for forage, besides a subsistence allowance of 7s. a day. If called out for permanent duty, they receive cavalry pay, with forage allowance. The yeomanry are available in aid of the civil power; and in time of invasion, or apprehended invasion, the sovereign may embody them for service in any part of Great Britain, under the provisions of the mutiny act and articles of war.

YEOMEN OF THE GUARD, a veteran company, consisting of 100 old soldiers of stately presence, employed on grand occasions, in conjunction with the gentlemen-at-arms, as the body-guard of the sovereign. These yeomen were constituted a corps in 1485 by king Henry VII., and they still wear the costume of that period. Armed with partisans, and in the quaint uniform, the men present a curious sight in the 19th century. The officers of the corps are a capt. (ordinarily a peer), a lieut. and an ensign. There is also a "clerk of the cheque and adjutant." All these appointments are held by old officers, and are considered as important prizes. The whole charge is borne by the sovereign's civil list. The head-quarters of the corps is at the tower of London, where the men are popularly known as *beef-eaters* (q.v.).

YEO'VIL, a small municipal borough of Somersetshire, 20 m. s. of Wells, on the borders of Dorsetshire, a busy, handsome place, built of red brick and yellow Hamhill (a neighboring quarry) stone, and situated in a pleasing district on a hill-side sloping to the Yeo. The church of St. John, a structure of the 15th c., is much admired. The height of the side aisles, and large size of the windows, give it grace and lightness, and hence it has been called the "lantern of the west." There are several other churches, besides schools, alms-houses, and other charities. Kid and other gloves are here more extensively manufactured than in any other town in England. There are about 20 manufactories, in which are produced about 10,000 dozen pairs of gloves per week. The number of males alone employed in this manufacture is about 2,000; the females, who sew the gloves, all work at home, and are much more numerous. Woolen manufactures and leather-dressing are also carried on. Pop. '71, 8,327.

YER'CUM, another East Indian name of the plants called mudar (q.v.) and their fiber.

YESSO, or **JESSO**. See **YEZO**, *ante*.

YETH'OLM, a parish of Scotland, in the n.e. of Roxburghshire, bordering on England, 15 m. e.n.e. of Jedburgh. The Beaumont water runs through the parish, and on either side of this stream are the villages of Kirk-Yetholm and Town-Yetholm, the former being the head-quarters of the gypsies in Scotland. According to the census of Scotland for 1871 the village of Yetholm contained 796 inhabitants.

YEW, *Taxus*, a genus of trees of the natural order *taxaceæ*, which is very generally regarded as a sub-order of *conifereæ*, and is characterized by solitary and terminal fertile flowers, with a solitary ovule sessile in the center of a fleshy disk, forming a sort of drupe when in fruit, and by dicotyledonous seeds. The genus *taxus* is distinguished by a solitary terminal seed, surrounded by a succulent cup. The species are diffused over the whole northern parts of the world, and are large and beautiful evergreen trees, with narrow lanceolate or linear leaves. The Common Yew (*T. buccata*), a tree of 30 to 40 ft., and a trunk sometimes of great thickness, branching a few feet above the ground, and forming a large and dense head, is a native of the middle and s. of Europe and of Siberia. Noble specimens of it are to be seen in many parts of Britain. It attains a great age, at least 300 or 400 years. Its wood has been much used from very early times for making bows, for which it is preferred to every other kind of wood. It is very hard, and reckoned almost equal to boxwood for fine work. The heart-wood is of an orange-red or deep-brown color. The fruit is red, and was long reputed poisonous, but the pulpy part is not so; the seed, however, is a dangerous poison. The leaves also are a powerful narcotic; and although they are sometimes given as a vermifuge, their use is attended with danger.—The Irish Yew (*T. fastigiata* of Lindley; *T. Hibernica* of Hooker), originally discovered in Ireland, and now very common in pleasure-grounds, is by many supposed to be a mere variety of the common species, with upright fastigate habit, but it differs also in having the leaves scattered, while those of the common yew are in two rows.—The North American Yew (*T. Canadensis*) is of humbler growth.—The name JAPAN YEW is sometimes given to *podocarpus neriophyllus*, a tree of a genus nearly allied to *taxus*, and recently separated from it. It is a large and stout tree, a native of Japan: its wood much valued for cabinet-work. Other species of *podocarpus* are natives of the warmer parts of Asia, of Chili, New Holland, etc. *P. nucifer* is a lofty tree of the northern provinces of Japan and mountains of Nepal, from the seed of which an oil is extracted, fit for culinary purposes, although the seed itself is too astringent to be eaten. To the order or sub-order *taxaceæ* belongs also the genus *salisburia* (see GRANGE), the genus *dacrydium* (q. v.), and *phyllodes*, a genus in which the foliage, as in *salisburia*, has a remarkable resemblance to the fronds of ferns. *P. trichomanoides* is a large New Zealand tree.

YEZD, a considerable city of western Persia, situated on the s.w. of the great desert of Khorassan, in lat. 32° 10' n., long. 54° 50' east. It is the great emporium of the internal commerce of the empire. Manufactures of silk stuffs, velvets, cotton and woolen fabrics, arms, and loaf sugar are carried on, and the bazaars are spacious and well supplied. Pop. 40,000. This includes about 4,000 Guebres (q. v.). This latter are exempt from military service, and are now said to be well treated, both by the authorities and inhabitants. They complain, however, of grievances, of which complaint was made to the shah when in London, by their kindred and co-religionists, the Parsees of Bombay, in June, 1873. See report by Mr. Ronald Thomson, Persian secretary of legation, on the population, etc., of Persia, 1838, and *Times* of June 28, and July 16, 1873.

YEZDEGERD or **ISDIGERD III.**, 617–651; came to the Sassanian throne in 632. In 636 the Moslems defeated the Persians in the 4 days' battle of Cadesia, when the Persian gen. Rustem was slain. The next year the capital Ctesiphon was taken by the Arabs, and in 64, the Sassanian dynasty was overthrown at Nehavend. Yezdegerd was a fugitive for the rest of his life, and was finally assassinated.

YEZO, or **JESŌ**, the most northerly of the four principal islands which compose the empire of Japan, lies n. of the central island of Nipon. Till lately, the interior was almost wholly unknown. Under the new régime, Yezo has been thoroughly explored, and extensive measures have been taken to colonize the island and develop its natural resources. The area is about 35,000 sq. m., and the pop. about 125,000, chiefly resident in the s.; the Ainos, a docile aboriginal race, thinly occupy the north. The surface of Yezo is mountainous, with volcanoes; it is rich in fine timber; valuable minerals, especially coal, are found; the rivers and coasts abound in fish. Bears, deers, and wolves exist in large numbers. The chief towns are Matsumai (q. v.), Hakodadi (q. v.), and Sapporo.

YGG DRASIL, the name given in Scandinavian mythology to a tree, the greatest and most sacred of all trees, which was conceived as binding together heaven, earth, and hell. It is an ash, whose branches spread over all the world, and reach above the heavens. It sends out three roots in three different directions: one to the asa-gods in heaven, another to the frost-giants, the third to the under-world. Under each root springs a wonderful fountain, endowed with marvelous virtues. From the tree itself drops a honey-dew. Among its branches and roots, several animals sit or run about: an eagle, a squirrel, four stags, a serpent, all having their own proper names. The serpent, Nithbögg, lies at the under-world fountain and gnaws the root of Yggdrasil; the squirrel, Ratatöskr, runs up and down, and tries to breed strife between the serpent and the eagle, which sits aloft.

Of this old-world myth too imperfect an account has survived to enable us to read its meaning. Some writers in the middle ages bring it into connection with the cross. It is

striking to find Virgil (*Georg.* ii. 291) describing the ash as sending its branches as high into the air as it sends its roots into the earth—

*Æsculus in primis, quæ quantum vortice ad auras
Ætherius, tantum radice in tartara tendit.*

Remarkable coincidences, although of a fragmentary kind, are also found in eastern traditions.

Jacob Grimm sees an intimate connection between the world-tree Yggdrasil and the *Irmensule*, of which numerous traces are to be found in the records of German antiquity. This is described by Rudolf of Fulda as a great trunk of a tree set upright, and worshiped in the open air; the name *Irmensul*, he explains as meaning the universal or all-sustaining pillar (Ger. *Säule*, pillar). Such a tree-idol was destroyed by Charles the great in his conquest of the Saxons in 772, at a place called Heresburg, in Westphalia, which was a chief seat of the pagan religion of the Saxons. The word *irmîn*, Ang.-Sax. *cornen*, was frequently compounded with other words in the earlier stages of the Teutonic languages, in the sense of universal, greatest of all. As the primitive nature-worship tended more and more to the personification of particular powers, these trunk-idols were associated with particular divinities, and perhaps had an image set upon them, or were cut into some rude resemblance, as in the case of the Greek pillar-images called *herma* (see HERMES). The coincidence of the names *irmîn* and *herma*, which may, however, be casual, has not failed to be remarked. The Christmas tree of modern Germany may be some kind of offshoot of the old notion of Yggdrasil.

Y'LANG Y'LANG. See IHLANG IHLANG.

Y-MOTH, *Phsia gamma*, a beautiful species of moth (q.v.) common in Britain and throughout great part of Europe, about an inch in entire length, without reckoning the antennæ, which are not quite half an inch. The color is lilac, variegated with brown, the upper wings beautifully marbled, with a shining mark nearly in the form of the letter Y, or of the Greek γ (gamma), whence the names. The lower wings are dirty white, with a broad smoky border, and a white fringe spotted with black. This moth flies about during the day in summer and autumn. It is very swift of flight. It lays its eggs on the under side of leaves. The caterpillar is slightly hairy, green with a yellow line along each side, and five white ones down the back. It feeds on the leaves of a great variety of plants, as peas, beans, turnips, cabbages, hemp, clover, oats, and other grasses. It sometimes ravages gardens, but more in France than in Britain.

YOGA (from the Sanskrit *yuj*, join; kindred to the Lat. *jung*-, Gr. *zeug*-, Gothic, *jiuk*-, hence *junction*, and figuratively, "concentration, religious or abstract contemplation") is the name of one of the two divisions of the Sāṅkhya philosophy of the Hindus. See SĀṆKHYA. While the first of these divisions, the Sāṅkhya proper, is chiefly concerned in teaching the *tattvas*, or principles of creation, and the successive development of the latter, the main object of the Yoga is to establish the doctrine of a Supreme Being, and to teach the means by which the human soul may become permanently united with it; and since the Sāṅkhya proper is silent on the creation of the world by a Supreme Being—whence it was charged, though unjustly, by its opponents, with being atheistical—the Yoga, which is called theistical, is considered to be its complement. According to *Patanjali*, the reputed author of this system, the term *Yoga* means "the hindering of the modifications of thinking;" and by such modifications, which, he says, may be accompanied with afflictions, or be free from them, he understands "the three kinds of evidence—viz., perception, inference, and testimony—misconception or incorrect ascertainment, fancy, sleep, and recollection." The "hindering of these modifications" is, according to him, effected either by a repeated effort to keep the mind in its unmodified state, or by dispassion, which is the consciousness of having overcome all desires for objects that are seen (on earth) or are heard of (in Scripture). Dispassion is conducive to meditation; this, again, is of different kinds, and is attained either "impetuously"—in adopting various transcendent methods—or "by a devoted reliance on *Is'vara*, the Lord." This Lord, or Supreme Being, *Patanjali* then defines as "a particular *Purusha*, or spirit, who is untouched by afflictions, works, the result of works, or deserts; in whom the germ of omniscience reaches its extreme limit; who is the preceptor of even the first, because he is not limited by time; and whose appellation is *Om*, the term of glory." This word is to be muttered, and its sense is to be reflected upon, for "from it comes the knowledge of *Is'vara*, and the prevention of "the obstacles" which impede Yoga. These obstacles, *Patanjali* says, are "illness, apathy, doubt, listlessness about the accomplishment of meditation, want of exertion, attachment to worldly objects, erroneous perception, failure to attain any stage of meditation, or inability to continue in the state of meditation when it has been reached." There are several other methods to prevent these obstacles from distracting the mind, and impeding its steadiness. One, for instance, consists in pondering over one single accepted truth; another in "practicing benevolence, tenderness, complacency, and disregard toward all objects in possession of happiness or grief, virtue or vice;" another, "in forcibly expelling or retaining the breath;" another, in "dwelling on knowledge that presents itself in dream or sleep;" etc. When all these modifications have disappeared, the mind becomes free from "the tingeing" of the exterior world, as the pure crystal is free from the color that seems to belong to it, when a

colored substance is seen athwart it. After having described the various modes in which the mind may appear changed into the likeness of what it ponders, the author of this system then proceeds to explain the practical Yoga, by which "concentration" may be attained. It comprises, according to him, mortification, the muttering of certain hymns, and a devoted reliance on the Lord. Through it meditation is established, and afflictions are got rid of. By afflictions, again, he understands ignorance, egotism, affection, aversion, and tenacity of life; which terms are then the subject of an especial investigation into the nature of what is to be got rid of, of what is not desired to be got rid of, of what is constituted by the cause, and of what is the constitutive cause.—There are eight means or stages subservient to the attainment of concentration—viz., forbearance (*yama*), religious observance (*niyama*), postures (*āsana*), regulation of the breath (*prāṇāyāma*), restraint of the senses (*pratyāhāra*), steadying of the mind (*dhāraṇā*), contemplation (*dhyāna*), and profound meditation (*śamādhi*).—The first stage, *forbearance (yama)*, consists in not doing injury to living beings, veracity, avoidance of theft, chastity, and non-acceptance of gifts; they are the universal great duty.—The second stage, *religious observance (niyama)*, comprises purity—external as well as internal—contentment, austerity, muttering of the Vedic hymns, and devoted reliance on the Lord.—The third stage of *Yoga postures (āsana)*, is defined by Patanjali, as "that which is steady and comfortable" at the same time. The commentators mention several varieties of such postures. According to an interesting treatise on the Yoga philosophy by Navinachandrapāla, one of these, called *Siddhāsana*, is practiced by placing the left heel under the anus, and the right heel in front of the genitals, by fixing the sight upon the space between the eyebrows, and, while in this motionless attitude, meditating upon the mysterious syllable *Om* (q.v.). Of the posture called *Padmāsana* the same treatise says, that it consists in placing the left foot upon the right thigh, and the right foot upon the left thigh, in holding with the right hand the right great toe, and with the left hand the left great toe, the hands coming from behind the back and crossing each other; while the chin rests on the interclavicular space, and the sight is fixed on the tip of the nose. When the command of such postures is attained, Patanjali says, the Yogin does not suffer either from cold or heat, hunger or thirst, or similar afflictions. The fourth stage, *regulation of the breath (prāṇāyāma)*, is threefold, according as it concerns exhalation or inhalation, or becomes tantamount to suspension of the breath, the latter also being termed *kumbhaka* (from *kumbha*, a jar), because "the vital spirits then are as motionless as water is in a jar." Through such a regulation of the breath, the obscuration of the pure quality of the mind is removed, and the latter becomes fit for acts of attention. Navinachandrapāla describes different processes of the Prāṇāyāma as selected from different authorities. One, for instance, consists, according to him, in the act of inhaling through the left nostril for 7.6788 seconds, suspending the breath for 30.7152 seconds, and exhaling through the right nostril for 15.3576 seconds; then inhaling through the right nostril for 30.7152 seconds, and exhaling through the right nostril for 7.6788 seconds, suspending the breath for 30.7152 seconds, and exhaling through the left nostril for 15.3576 seconds; lastly, inhaling through the left nostril for 7.6788 seconds, suspending the breath for 30.7152 seconds, and exhaling through the right nostril for 15.3576 seconds. To the *kumbhaka*, of which there are eight varieties, the same author observes, two processes are indispensable: sitting in one of the postures described, and, by means of an incision in the frænum linguae, and milking, as it were, the tongue, causing it gradually to become so lengthened as to allow the rima glottidis to be shut by pressing back the epiglottis with the point of the retroverted tongue. Such *kumbhakas*, it is supposed, produce the most wonderful effects: some of them cure diseases of the head and lungs, dropsy, etc.; others make proof against all sorts of inflammation and fever; the eighth or last variety of the *kumbhaka*, especially, cures all diseases, purges from all sins, promotes longevity, enlightens the mind, and awakens the soul.—The fifth stage of Yoga, the *restraint of the senses (pratyāhāra)*, means the withholding of the senses from their respective objects, and the accommodating them entirely to the nature of the mind. According to an authority quoted by Navinachandrapāla, a Yogin's senses are suspended when he can suspend the respiratory movements for 10 minutes and 48 seconds.—This stage is preparatory to the sixth, or the *steadying of the mind (dhāraṇā)*, which means the freeing of the mind from any sensual disturbance, by fixing the thoughts on some part of the body, for instance, on the naval or the tip of the nose. This stage, it is supposed, can be accomplished when the Yogin is able to suspend his respiratory movements for 21 minutes and 35 seconds; and, according to Navinachandrapāla, it is effected by different processes—muttering the syllable *om* 144,000 times, fixing the eyes upon the tip of the nose, or the space between the eyebrows, for two hours, swallowing the tongue for two hours, etc. *Contemplation (dhyāna)*, the seventh stage of Yoga, is the fixing of the mind on the one object of knowledge, the Supreme Spirit, so as to exclude all other thoughts. It is practiced in consequence of the "steadying of the mind," as defined before; and, according to the authority quoted by Navinachandrapāla, a man can accomplish it when he is able to suspend his respiratory movements for 43 minutes and 12 seconds.—The eighth and last stage of Yoga, *profound meditation (śamādhi)*, is the perfect absorption of thought into the one object of meditation, the Supreme Spirit; it is devoid, as it were, of any definite character, which would suggest a term as applicable to it. In such a state, Navinachandrapāla says, "a Yogin is insen-

sible to heat and cold, to pleasure and pain; he is insensible to blows and wounds, to the effects of fire; he is the same in prosperity and adversity; he enjoys an ecstatic condition. He is free from lust, fear, and anger; he is disengaged from all works. He is not affected by honor and dishonor. He looks upon gold, iron, and stones with the same unconcerned eyes. He is the same in love and in hatred; he is the same among friends and enemies." And, according to the authority he quotes, such a state may be attained by a man who can suspend his respiratory movements for 1 hour 26 minutes and 24 seconds. The last three stages are also comprised under one distinctive name, *sam'yam'a*, or "restraining," because it is chiefly on the perfection attained in these three collectively that depend the wonderful results which are promised to a Yogin when he applies them to the contemplation of special objects. Such results are, for instance, a knowledge of the past and future, a knowledge of the sounds of all animals, of all that happened in one's former births, of the thoughts of others, of the time of one's own death, a knowledge of all that exists in the different worlds, of stars and planets, of the structure of one's own body, etc. There are especially, however, eight great powers which a Yogin will acquire when properly regulating and applying the *sam'yama*—viz., the power of shrinking into the form of the minutest atom; that of assuming a gigantic body; that of becoming extremely light; that of becoming extremely heavy; that of unlimited reach of the organs (as touching the moon with the tip of a finger); that of irresistible will; that of obtaining perfect dominion over the inner organs of the body; and that of acquiring mastery over everything. If the Yogin applies *sam'yama* to the contemplation of the smallest divisions of time, and the successive order in which such divisions occur, he obtains a discrimination which enables him to understand the subtle elements, and to see all objects at once. When his intellect has become free from all considerations of self, and his spirit is no longer subject to the result of acts performed, and when both have thus obtained the same degree of purity, the Yogin obtains eternal liberation.—In the last chapter of his work, Patanjali then shows that these perfections are not always obtained by Yogins in one birth, but that *Prakṛiti*, or nature (see SĀNKHYA), generally in a succession of births, brings to maturity the result obtained in a prior birth. He thus makes nature, not actions, the cause of each effect; meritorious actions merely serving, according to him, to remove the obstructions which, from bad actions, would arise to its regular progress, just as water would take its natural course after the husbandman, who would want to lead it from field to field, had removed the obstructions that lay in its path. After having then taught that the result of actions, in successive births, consists in the recollection of a prior state, and in the obtainment of a special (existence, a special duration of life, and special enjoyments); and after having discussed the different influences to which the mind may become subject in its union to different objects, Patanjali winds up with describing the mode in which final liberation gradually takes place. First, he says, when a person has obtained the discrimination conveyed by the Yoga doctrine, all ideas of self—such as, I am different from another—cease. In consequence, thought is turned inward, and this is the commencement of liberation. But, as still recollections, derived from former existences, sometimes prevail in his mind, they must be abandoned by him in the same way as he has to overcome the afflictions, above specified. When he has succeeded in this, his knowledge will have become so infinite, that but little will remain for him to be known. Then the cosmi-*cal gunas*, or qualities, too (see SĀNKHYA), having accomplished the main object of spirit, will have gradually arrived at the end of their functions, and, as a consequence, matter will become separated from spirit. This is *kaivalya*, or true liberation, for the mere power of the mind to retain its nature after dissolution has taken place, is not yet true liberation.—The practical part of the Yoga was admitted into the later vedānta (q.v.). Its ethical portion is especially dwelt upon in the celebrated episode of the Mahābhārata (q.v.), the *Bhagavadgītā*. But the great power it has at all periods exercised on the Hindu mind, is less derived from its philosophical speculations or its moral injunctions, than from the wonderful effects which the Yoga practices are supposed to produce, and from the countenance they give to the favorite tendency of orthodox Hinduism, the performance of austerities. It is needless, however, to say that frequently these practices were and are merely a cloak for imposture and hypocrisy, and that the professional Yogins (q.v.), numbers of whom are met with throughout India, are often nothing but lazy mendicants or jugglers, who, by impressing the vulgar with a belief in their supernatural powers, convert it into a source of an easy livelihood. Such followers of the Yoga pretend, for instance, to foretell future events; they deal in palmistry, and profess to cure diseases. There are instances, too, where, for a handsome consideration, they allow themselves to be buried for a certain time, so as to exhibit the power of the Yoga. Two such cases are related as authentic in the treatise of Navinachandrapāla; and it would appear from them, that a human being, after having undergone certain preparations, such as the Yoga prescribes them, may be shut up in a box without either food or drink, for the space of a month, or even forty days and nights, and yet remain alive. The author of the treatise endeavors, indeed, to show that the rules laid down by the Yoga regarding the mode of respiration, the postures, and the diet of a Yogin, may have been founded on a careful observation of the nature and habits of hibernating animals; and in support of this view, he enters into a detailed investigation of the effect of the Yoga

practices on animal life. If, as it seems, his statements are correct, much of what otherwise would be incredible in the accounts given of the performances of Yogins, could be received as true, because admitting of explanation. The system *patanjali* was taught by him in a little work called *yogasātra*, which consists of four *pādas*, or chapters, each comprising a number of *sūtras* (q.v.). The oldest commentary on it is ascribed to a *vyāsa* (q.v.); and this was commented on by *Yachaspati-Misra*. Of other commentaries, those by *Vijñānabhikṣu*, *Bhojadeva*, and *Nāgajibhatṭa*, are the most approved.—For a fuller enumeration of works on the Yoga, see *A Contribution toward an Index to the Bibliography of the Indian Philosophical Systems*, by Fitzedward Hall (Calcutta, 1859). The first two chapters of the *sūtras* have been translated, with annotations, founded on the commentary of Bhojadeva, by the late J. R. Ballantyne (Allahabad, 1853); and a paraphrase, but somewhat too free, of the same commentary is contained in the 4th vol. of William Ward's *View of the History, Literature, and Religion of the Hindus, etc.*, 4 vols. (London, 1817–20). For a brief account of the system, see also the 1st vol. of H. T. Colebrooke's *Miscellaneous Essays*, 2 vols. (London, 1837); and for the practice of the Yoga, *A Treatise on the Yoga Philosophy*—that referred to above—by N. C. Paul (i.e., Navinachandrapāla), (Benares, 1851).

YOGIN, a follower of the Yoga system of Hindu philosophy (see **YOGA**), but in popular acceptation a term generally denoting a Hindu ascetic or devotee, a man who has entered the fourth stage of religious life as described in the *sāstras*. A large class of such persons forms a division of the votaries of Śiva. See **ŚAIVAS**.

YOKOHAMA (Japanese for "cross shore"), a t. of Japan, in the island of Nipon, and the port for the foreign trade of Tokio. It is situated on the s. side of a bight of the bay of Yedo, about 17 m. from Tokio, and opposite to Kanagawa. In 1854, it was only a small fishing village, but after it supplanted Kanagawa as the treaty port of Tokio in 1859, it rapidly increased. The Japanese government built at a great outlay solid granite piers and landing-places, a large custom-house, official residences, and shops for Japanese traders; besides houses and godowns for the foreign community and merchants. It now extends along the sea-shore for about $1\frac{1}{2}$ m., and is two or three streets deep. Pop. '72, 61,553. The custom-house is nearly in the center of the town; and e. and w. of it, lie respectively the foreign and native quarters. The shops are filled with goods to suit the foreign taste—such as lacquered ware of rare quality and bronze-work, baskets and porcelain, fancy silks and embroidery, curiosities and articles of *vertu*. Since the recent changes in the policy of the Japanese government, great improvements have taken place in the native quarter. Broad and cleanly streets are rapidly superseding the former dirty and narrow thoroughfares. A canal is drawn as a cordon around the settlement on the land-side, and in 1871 the Japanese government widened and deepened it very considerably. Other important undertakings have recently been carried out, the chief of which is a railway from Yokohama to Tokio. Gas was introduced in 1872.

In 1877, the imports (cottons, woollens, metals, etc.) were valued at \$20,000,000; the exports (silk, tea, rice, copper, etc.), at \$16,000,000. In 1876–77, 214 ships, of 309,178 tons, entered Yokohama.

YOLO, a co. in n. central California, bounded on the e. by the Sacramento river, and on the s. by Putah creek; about 975 sq. m.; pop. '80, 11,772—9,099 of American birth. Co. seat, Woodland.

YONGE, CHARLOTTE MARY, a novelist of considerable merit and popularity, was born in the year 1823. She is a daughter of the late William Crawley Yonge, esq., of Otterbourne, Hampshire, sometime an officer in the 52d regiment. The work by which she is best known is *The Heir of Redcliffe*, which had great success, and has gone through several editions. Besides this, she is the author of *Heart's Ease*; *Dyncevor Terrace*; *The Daisy Chain*; *The Lances of Lynwood*; *The Little Duke*, etc. These works exhibit much literary accomplishment, and have secured for Miss Yonge a public of her own. The spirit which pervades them is pure, amiable, and pious; and commonly the stories are more or less contrived as vehicles of the high church opinions to which the writer is warmly attached. Considerable sums accruing from the sale of her writings she is said to have devoted to the aid of religious missions in New Zealand. In addition to the fictions by which she is chiefly known, Miss Yonge has published a work *On Christian Names, their History and Derivation*, in which much curious erudition is displayed; *Life of Bishop Patteson* (1873); and several historical works.

YONKERS, a city of New York, on the e. bank of the Hudson river, 16 m. n. of New York city hall. In 1872 the town of Yonkers was divided, the northern part being constituted the city of Yonkers; the southern portion became part of New York city in 1874. Pop. '75, 17,269.

YONKERS (ante), a city in Westchester co., N. Y., on the e. bank of the Hudson river, and on the Hudson River railroad, about 16 m. n. of New York; pop. '80, 18,892. It is built on several hills, and contains many fine residences, especially on the high land toward the north. The city has gas-works, water-works, and a police department, which is in telegraphic connection with the New York police department. Yonkers has churches, schools, banks, hotels, 3 weekly newspapers, and a public reading-room. A small stream called the Nepperhan furnishes a valuable water-power. Among the manufac-

turing establishments are silk factories, mower and reaper works, carpet factories, hat factories, machine-shops, elevator works, and the works of the Eagle pencil company. Kingsbridge, which was set off from Yonkers in 1872, was annexed to New York in 1874. Yonkers originally lay within the manor of Colendoneck, which comprised 24,000 acres, owned by the patroon Van der Donck. Much of it afterward passed into the hands of the Philipse family, and was confiscated after the revolution.

YONNE, a department in the n.e. of France, bounded on the n. by the department of Seine-et-Marne, on the e. by Aube and Côte-d'Or, on the s. by Nièvre, and on the w. by Loiret. Area 2,860 sq.m.; pop. '76, 359,070. The department is watered by the river Yonne, which flows across it in a n.e. direction. The surface is hilly, many of the hills being covered with fruitful vineyards, the intervening valleys being beautiful and fertile. The vineyards yield annually upward of 23,000,000 gallons of wine. There are some fine forests in the department. The climate is generally healthy, except in the s.w., where the marches often give rise to fever. The soil produces abundance of grain, but the cultivation of the vine is of the greatest importance, the best wines produced here being those of Chablis, Joigny, Auxerre, and Tonnerre. The chief mineral products are red granite, marble, lithographic stones, pavement, red and yellow ocher, iron. There are manufactures of cottons, woollens, beet-root sugar, bricks, tiles, etc. The chief exports are timber, corn, and wine. It is divided into five arrondissements—viz., Auxerre, Avallon, Joigny, Sens, Tonnerre. The railway from Paris to Lyons passes through the department. The capital is Auxerre; the other chief towns are Avallon, Joigny, Sens, and Tonnerre.

YORITOMO, 1146-99; b. Japan; son of Yoshitomo Minamoto. He was the first of the mikado's subjects upon whom was conferred the title *Sei-i tai shogun* (great general who tranquilized the barbarians), the same office which in the American treaty of 1854 is ascribed to the "tycoon." He founded the city of Kamakura, near the modern Yokohama, in 1181; annihilated his rivals, the Taira family, after many bloody battles; and in 1192 received from the mikado the title and office by which Japan henceforth, until 1868, had two capitals or centers of power; two kinds of government, civil and military, or "the throne and the camp;" and two rulers, mikado and shogun (or tycoon), at Kioto and Kamakura (or later, Yedo). His life came to an end by the death of his grandson Sanetomo, by assassination, in 1219.

YORK, a co. in s.w. Maine, bounded on the n. by the Ossipee river, on the e. by the Atlantic ocean, and on the s.w. by the Piscataquis and Salmon Falls rivers, which separate it from New Hampshire; about 900 sq.m.; pop. '80, 62,265—53,321 of American birth. Co. seat, Alfred.

YORK, a co. in s.e. Nebraska; 576 sq.m.; pop. '80, 11,170—9,119 of American birth. Co. seat, York.

YORK, a co. in s. Pennsylvania, adjoining Maryland, bounded on the n.e. by the Susquehanna river; about 875 sq.m.; pop. '80, 87,839—84,981 of American birth. Iron is found. Co. seat, York.

YORK, a co. in n. South Carolina, bordering on North Carolina; about 800 sq.m.; pop. '80, 30,713—30,613 of American birth; 16,677 colored. Iron ore, gold, manganese, and limestone are found. Co. seat, Yorkville.

YORK, a co. in s.e. Virginia, bounded by York river and Chesapeake bay; 150 sq.m.; pop. '80, 7,348—7,316 of American birth; 4,512 colored. Co. seat, Yorktown.

YORK, a co. in s.w. New Brunswick, separated from Maine by the St. Croix river; 3,472 sq.m.; pop. '71, 27,140—9,695 of Irish, 3,917 of Scotch descent. Co. seat, Fredericton.

YORK, a co. of Ontario, Canada; bordering on lake Ontario; 913 sq.m.; pop. '71, 115,974—41,168 of Irish, 17,044 of Scotch descent. Co. seat, Toronto.

YORK, a river of Virginia, formed by the union of the Pamunkey and Mattaponi, flowing s.e. to the Chesapeake bay, nearly opposite cape Charles. It is 40 m. long, and from 1 to 3 wide. Yorktown, an ancient but decayed port, on the right bank, 11 m. from its mouth, was the scene of lord Cornwallis's surrender, Oct. 19, 1781.

YORK, a shire-town of Pennsylvania, on Codorus creek, 10 m. s.w. of the Susquehanna river, 28 m. s.s.e. of Harrisburg, at the intersection of several railways. It has a spacious granite court-house, numerous churches, handsome residences, 6 banks, 7 newspapers. Pop. '70, 11,003.

YORK (*ante*), a city and co. seat of York co., Penn., 58 m. n. of Baltimore, on the Northern Central railroad; pop. '80, 13,940. It was settled in 1741, and incorporated as a city, 1787. The continental congress had its sessions at York from Sept., 1777, to July, 1778. The court-house is a handsome granite building. There are manufactures of cars, agricultural implements, shoes, matches, and paper. The trade with the surrounding country, mostly inhabited by people of German descent, is large. There are seven banks, six weekly and one daily newspaper, an academy, young ladies' college, and the York collegiate institute. In 1863 the town was occupied by the confederate gen. Early, who levied a contribution of \$100,000 on the people.

YORK, the capital of Yorkshire, is situated at the junction of the rivers Ouse and Foss, the three ridings of the county meeting at the same place, and is nearly equidistant from London and Edinburgh. It is the seat of an archbishopric, a county in itself, and a municipal and parliamentary borough. The government is vested in 12 aldermen and 36 councillors, of whom one, as in the case of London, is lord mayor. It returns two members to parliament. The population in '71 was 43,796, being an increase from '61 of 3,363 persons, and 904 inhabited houses. In the registration district of which York is the center, there are 83 parishes, with an area of 82,545 statute acres, and a population in '71 of 64,909.

York is among the most ancient of British cities. Before the Roman invasion it was one of the chief towns of the Brigantes, the most numerous and powerful of the British tribes. It was constituted a Roman station, under the name of *Eboracum*, by Agricola about 79 A.D., and was very soon the principal seat of Roman power in the n., perhaps in Britain. While the Roman dominion existed in the island York was a city of the first importance. Here Hadrian lived and Severus died. Here, too, died Constantine Chlorus, the father of Constantine the great, and here, as many believe, his greater son was born. When the emperors visited the province York was their chosen residence, and it was the abode of the imperial legates when the emperors were absent. Little is known of the city for a century after the departure of the Romans, about 409 A.D., but it certainly suffered much during the long conflict between the Britons and the Picts, against whose incursions York was a material defense. It afterward became the capital of Northumbria. The first metropolitan church in England was built here by Edwin, the Northumbrian king whom Paulinus baptized; and here also Edgar, the first sole monarch of England, held, in the year 966, the witenagemot. William the conqueror was long unable to overcome this stronghold of the n., notwithstanding his coronation by its archbishop, Aldred. One Norman garrison, numbering 3,000 men, was put to the sword in 1069, but William exacted a terrible vengeance in the following year, when he laid waste the whole country between York and Durham.

The first English parliament was held at York in 1160 by Henry II., and for 500 years afterward parliaments continued to be summoned occasionally to the ancient city. Under Henry III., the courts of king's bench and exchequer sat at York for seven years; and for a few months Richard II. removed thither the courts of king's bench and chancery. During the insurrections consequent upon the dissolution of the monasteries by Henry VIII., York was seized by the insurgents of the "pilgrimage of grace;" and in its immediate neighborhood, Fairfax, in 1644, conquered prince Rupert on Marston Moor. Typical of a very different time and order of things is the fact that the British association for the advancement of science was first organized at York in 1831.

A city so ancient necessarily presents many interesting memorials of antiquity. There are remains or memorials of Roman towers and temples, and of the earliest British churches. One of the most magnificent of the Anglo-Saxon churches was erected at York in the 8th c., and this, destroyed by fire, rebuilt, enlarged, and changed from time to time, is now known as York minster. A portion of the original church was disinterred during the excavations which followed the latest burning of the minster, in 1829. The present structure takes rank with the finest specimens of Gothic architecture in the world. It was mainly built in the 13th and 14th centuries. Its length, from base to base of the buttresses, is 524 ft., and its extreme breadth 250 ft., being 24 ft. longer than St. Paul's cathedral, and 149 ft. longer than Westminster abbey. The magnificent east window is 75 ft. high and 32 ft. broad, and contains about 200 compartments, each a yard square, representing scriptural subjects. War and fire have conspired to deform or destroy this splendid cathedral. Twice it has been burned down, once in 1069, and again in 1137, each time to rise more beautiful than before. During the times of the commonwealth much damage was done by war and wantonness, and several of its older monuments were mutilated or broken up. In 1829 it was set on fire by Jonathan Martin, a maniac; and the roof of the choir, 222 ft. long, with all the wood-work on each side, was destroyed. While this disaster was being repaired, a workman's candle was carelessly left burning, one night in 1840, and again a terrible fire broke out, destroying the south-western tower, with its splendid peal of bells, and the roof of the nave. The cost of the repairs exceeded £100,000.

A monastery of Benedictine monks was built, or rather completed, at York in the time of William Rufus, which was in great part reconstructed about the end of the 13th century. Its abbot had a miter and a seat in parliament. Some portions of the original building yet remain. Thirteen seeders from this monastery established, in 1131, the neighboring abbey of Fountains, near Ripon, under Cistercian rule. On the site of the Benedictine monastery now stand the museum and gardens of the Yorkshire philosophical society. The same order had a priory dedicated to the holy trinity in Micklegate, and a nunnery outside the walls at Clementhorp. Besides these the Dominicans, Franciscans, Augustinians, and Carmelites had each a monastery, and the Gilbertines a priory, within the city. In the immediate neighborhood were 16 hospitals. At the reformation, York contained 41 parish churches, 17 chapels, 16 hospitals, and 10 religious houses. Twenty-two of the churches yet remain, and several new churches have been built. The Roman Catholics have a fine pro-cathedral. There are numerous dissenting places of worship.

The educational institutions of York are numerous and useful. Notable among them are St. Peter's school, founded in 1557; archbishop Holgate's free school, dating from Henry VIII.; the blue coat school for boys, and the gray coat for girls, supported chiefly by annual subscriptions; and the Yorkshire school for the blind, conducted in a palace originally built for the lord president of the council of the north. York publishes one daily and three weekly newspapers.

A fine art exhibition was held at York in 1879; the building erected for it contains a concert-hall and picture galleries. The Yorkshire philosophical society was formed in 1822, and possesses a handsome building and gardens on the site of St. Mary's abbey, with a museum, rich in antiquarian relics and specimens illustrative of natural history. Among other public institutions are the county hospital, the first established in England n. of the Trent; the lunatic asylum; the dispensary; the Friends' retreat; and many charitable foundations for the benefit of poor persons. The ancient castle, with the exception of its imposing Clifford's tower, is superseded by the modern and commodious assize courts. The Guildhall, a fine Gothic building, was erected in 1446. There are also convenient assembly and concert rooms, and a creditable theater.

Whatever the trade of York may have been in ancient times—and old writers speak of it in glowing terms—it counts for little now. The making of leathern gloves, combs, glass, etc., supplies employment to many; some find employment in iron-foundries, in flax-spinning, and the manufacture of linen; and of late, the construction of railway carriages has become part of the city industry.—See Drake's *Eboracum*; Browne's *History of the Metropolitan Church of St. Peter's, York*; Britton's *Cathedral Antiquities—York*; Hargrave's *History of York*; Gent's *York*; Wellbeloved's *Eboracum, or York under the Romans*.

YORK, HENRY BENEDICT MARY, Duke of, cardinal and bishop of Frascati, the last male descendant of the royal house of Stuart, was the second son of James (III. of England), commonly known as the pretender. He was born at Rome, Mar. 26, 1725; and after the failure of the attempt of his elder brother, Charles Edward, in 1745, resolved to enter the church. He was admitted to tonsure and minor orders by Benedict XIV., and created cardinal in 1747. Clement XIII. consecrated him bishop of Corinth *in partibus infidelium*, and afterward of the suburban see of Frascati, where he took up his residence. He also enjoyed, through the favor of the crown of France, the revenues of two abbeys, which he held *in commendam*, as well as a pension from the Spanish court; and the liberal charity with which he dispensed his income among the poor, and for the other charitable and religious necessities of his diocese, endeared him to his flock. These resources were lost at the revolution; but, nevertheless, in the distresses of the holy see which ensued, cardinal York sold his family jewels for the purpose of relieving Pius VI. in his necessities. On the occupation of Rome he withdrew to Venice; but he returned in 1801, on the restoration of the papal authority under Pius VII. George III., having become aware of the failure of his former means of income, granted him a pension of £4,000 a year, which he accepted, and enjoyed till his death. Those to whom a printed record of the "Last of the Stuarts" may be interesting, will find a small collection of his "pastoral letters," in a 4to volume published in Rome, and entitled *Appendix ad Tuscanam Synodum a Celsitudine Regia Emmentissimi Henrici Episcopi Tusculani* (Rome, 1764). He was appointed by Pius VII. dean of the sacred college, and held several other dignities, and was much respected, as well by the Italians as by foreigners visiting Rome. He died at Frascati, July 17, 1817, at the advanced age of 92. His last will, which is a very interesting document, is printed by Artaud in his *Vie de Pie VII.* His monument, by Canova, in St. Peter's, was erected by order of the prince regent, afterward George IV.

YORK, HOUSE OF. See PLANTAGENET.

YORKSHIRE, which is larger in territorial extent than any other two counties in England, is situated nearly in the center of Great Britain, about midway between London and Edinburgh. "Its extreme points," says Allen, in his history of the county, "lie between the parallels of 53° 18' to 54° 40' n. lat., and between 2° 40' of w. to 0° 10' of e. long. from Greenwich. On the n. side, it is separated, in its whole extent, from the county palatine of Durham by the river Tees; from the mouth of the same river to the entrance of the Humber, the whole e. side is bounded by the German ocean; on the s. side it is divided from Lincolnshire by the rivers Humber and Trent. The boundaries between Yorkshire and the counties of Nottingham, Derby, Cheshire, Lancashire, and Westmoreland are merely conventional, being indicated by no natural feature of the country." The longest diagonal of the country, n.w. to s.e., extends about 130 m.; the shortest, s.w. to n.e., about 90. It contains about 6,095 sq.m., or 3,882,851 statute acres. It is divided into three Ridings, North, East, and West, and a small district not included in any of the three, the Ainsty of York. The Ridings (a corruption of tri-thing or thirthing) date back to Saxon times, and are peculiar to Yorkshire. Each has a separate military and civil jurisdiction, and each its own lord-lieutenant and public buildings. The North Riding contains 11 wapentakes; the East, 6; the West, 9. In the whole county, besides the archiepiscopal city, there are 59 market-towns, and 1639 parishes, townships, and places. The North Riding (including for parliamentary purposes the Ainsty and city of York) returns 2 county and 12 city and borough members;

the East Riding, 2 county and 2 borough members; the West Riding, 6 county members (2 for the eastern division, 2 for the northern, and 2 for the southern) and 16 borough members. According to the census of 1871, the population was 2,436,355. Three-fourths of the whole number were resident in the West Riding. Since the first census in 1801, the population had increased by 1,577,222 persons, or 184 per cent.

The history of the county in early times may be mainly read in that of its chief city. Apart from the events which transpired at, and in connection with York, there is little to be recorded. It was originally occupied by the Brigantes, and was subjected by the Romans under Agricola about 71 A.D. When the Roman occupation ceased, it was long and greatly troubled, first by Pietish, and then by Saxon incursions. Under Saxon rule, the traces of Brigantian occupancy were soon obliterated, only the rivers, mountains, and a few remarkable natural curiosities retaining their British names, while all things else received Saxon designations. The county formed part of the kingdom of Northumbria, taking the name of Deira (the country of Deer), when that kingdom was divided. In the troublous times which preceded the conquest, many battles were fought against invading Danes, and generally with success. At Stamford Brig, a few miles from York, Harold, the last of the Anglo-Saxon kings, defeated the united Danish and Norwegian armies, three weeks before he fell before the Normans on the fatal field of Hastings. Among the more notable events of later history, may be named the battle of Wakefield, where the duke of York was defeated by queen Margaret in 1460; the battle of Towton field, near Tadcaster, fought on Palm Sunday in 1461, the most sanguinary conflict of the bitter war between the rival roses; and that of Marston Moor, which gave the final blow to the falling fortunes of Charles I. Since that time, with slight exceptions, the history of Yorkshire has been one of peace and prosperity.

The surface of the county is greatly diversified. On its north-western border runs a range of lofty hills, many of them containing extensive caverns, and giving birth to wild and romantic streams. Here is Ingleborough, 2,361 ft. above the sea-level, with its marvelous cave, half a mile long, full of beautiful stalactites; Whernside, 2,384 ft. high, with its subterranean cataract of 75 ft. in Weathercote cavern; and the vast mass of Mickie Fell, 2,600 ft., which overlooks the waters of the Tees and Lune. Eastward, far away, rise the Hambleton and Cleveland hills. Lower down are the wolds, a line of chalk hills stretching from Flamborough Head to Ferriby on the Humber. The hills and dales of Craven, which cover a large tract of country in the w., abound in natural beauty. Right down the center of the county, from the Tees to the Humber, runs the great vale of York. Across its northern border flows the Tees. Coming southward, we find the dales of the Swale, Ure, the Nidd, the Wharfe, the Aire, the Calder, and the Don, all on the western side of the county, each sending a river to the central vale, where the united waters, with the Derwent and a few smaller tributaries from the e., form the Ouse; while the Ouse, after uniting with the Trent, becomes the Humber estuary, which rolls eight-tenths of the Yorkshire waters to the sea. The Ribble, rising in Craven, passes by Preston, and falls into the Irish channel, and is the only Yorkshire river which finds a western outlet. The Esk joins the German ocean at Whitby, and the Tees between Redcar and Hartlepool.

Geologically, Yorkshire is too large a subject for us to do more than touch. The vale of Yorkshire, rarely more than 100 ft. above the sea, has on its western side the long slow elevations which culminate in the Pennine chain, while on the e. rise the lower but more sudden eminences of the wolds and the high grounds of Hambleton and Cleveland. On the w. are the millstone grit and mountain limestone, the two coming together in lofty opposing eminences in many parts of Craven, where, along the line of what is called by geologists the "Craven fault," the limestone rises into magnificent cliffs many hundreds of feet in height, and nearly 2,000 above the level of the sea. The limestone is in many places very rich in lead ore. On the e. lie the chalk wolds, and the oolitic and lias formations, with the Kimmeridge clay of the vale of Pickering, and the accumulations of sand, gravel, and other sediments which make up Holderness. In the south-western district is a splendid coal-field, intermixed with ironstone, extending over 600 sq. miles. Valuable deposits of iron ore have also been discovered recently in Cleveland, in the north-eastern part of the county.

In the n.w., the lower parts of the North Riding, Craven, and the East Riding, the land mainly supplies occupation to the inhabitants. Craven is almost purely a grazing district, and so are most of the upper lands and dales in the county. Excellent corn is grown in the vales of York and Cleveland, and the East Riding has many large and excellent farms. The horses of Yorkshire, both for the race-course and for use, are too well known to need eulogy. The manufactures of the county are immense. Leeds is the center of the woolen, as Bradford is of the worsted trade. Sheffield is the principal seat of the cutlery manufacture; while the Cleveland district is rapidly rising into importance for mineral wealth and enterprise. The large iron-works of Low Moor, Bowling, and Rotherham, and the flax and linen manufactures of Leeds and Barnsley, merit a passing notice, with the blankets and cloths of the Huddersfield district, and the new llama and alpaca industry introduced at Saltaire near Bingley, by sir Titus Salt. Harrogate, Ilkley, Askern, and Croft are the principal inland health-resorts of the county; Scarborough, Filey, Bridlington, and Whitby take the lead on the coast.

The public works of Yorkshire rank with the finest in the kingdom. Among them are the Aire and Calder navigation, 15 m. long; the Calder and Hebble navigation; the navigation of the Don and Sheffield region, 40 m.; and the Huddersfield canal, one of the most surprising engineering works in England. This canal is 20 m. in length, and rises between Huddersfield and Marsden by 42 locks to the height of 656 feet. At this elevation, the highest canal-level in the country, it passes by a tunnel more than 3 m. long under Standedge, a range of hills between Marsden and Saddleworth. The canal terminates near Dukinfield. Add to these the Leeds and Liverpool canal—which cost 46 years of labor, and is 129 m. long—besides many smaller but very costly undertakings, and some idea may be formed of the activity of Yorkshire in this direction. Its railway communications are excellent, and grow in number and completeness every year. On these lines, in consequence of the mountainous districts through which many of them pass, are to be found some of the longest and most difficult tunnels, viaducts, bridges, embankments, and cuttings which have yet been attempted by engineers in England.

A very brief reference to the antiquities and natural curiosities of the county must suffice. Traces of great Roman roads are found in many places, as well as of Roman, Saxon, and Danish encampments. In the wolds are many tumuli; and it is supposed by some that the singular and imposing mass of rocks called Brimham crags, which overlook Nidderdale, about 4 m. from Pateley bridge, was once a Druidical temple. The ruins of ancient abbeys and priories are numerous and beautiful. Few can rival the glories of fountains and rievaulx, and the scenery which encompasses Bolton priory is delightful. Besides these there are the ruins of Kirkstall, Rochie, and Selby in the West Riding; St. Mary's at York; Jervaux, Byland, and Whitby in the North Riding; and many others. Of castles we may name, in the West Riding, Conisborough castle, near Doncaster, one of the oldest and most interesting ruins known to antiquaries; Knaresborough, Pontefract, and Skipton, the last still used as a residence; in the North Riding, Richmond, with its unrivaled Norman keep; Middleham castle, where the king-maker, Warwick, lived, and where Edward IV. was immured; and Bolton castle, the prison for a time of Mary queen of Scots; in the East Riding, Wressle castle, once the home of the Percies. Of old York castle nothing now remains but its massive Clifford's tower.

The lover of the picturesque will find the Yorkshire scenery full of charms. The rapid of Caldron Snout, on the Tees, 200 ft. in descent; High Force, on the same river, a perpendicular fall of 69 ft. over a cliff of greenstone marble; Aysgarth Force and Hardraw Force, on the Ure; the Strid, immortalized by Wordsworth, in Bolton woods on Wharfe; the magnificent Gordale Scar and Malham Cove, each nearly 300 ft. in height, on the upper waters of the Aire; and the uncounted glens and streams among its myriad hills are sufficient to indicate the attractions of its river and mountain aspects. It would require a volume to do them justice.—See Allen's *History of the County of York*; Whitaker's *Historical of Richmondshire, Craven, and Leeds*; Hunter's *Hullamshire*; Gent's *York, Ripon, etc.*; Phillips's *Geology of Yorkshire, and Rivers, Mountains, and Sea-coasts of Yorkshire*.

YORKTOWN, capital of York co., Va., s. side of York river, 10 m. from its mouth, is chiefly noted for its two sieges, 1781 and 1862. Cornwallis having established himself here Aug. 1, 1781, fortified the town with 7 redoubts and 6 batteries on the land side, and a line of batteries along the river. Gloucester point, on the opposite side of the river, was also strongly fortified. He had an army of 8,000 supported by several vessels anchored in York river. Washington, with the combined French and American army, suddenly leaving New York, reached Williamsburg, and, Sept. 28, marched to the investment of Yorktown with a force of 16,000, of whom 7,000 were Frenchmen. A French fleet under col. de Grasse had one hour before entered the Chesapeake, and, by blocking the James and York rivers, cut off communication between the British at Yorktown and New York. In the siege the French were posted in front. Oct. 9 the batteries opened, dismounting many of the guns and destroying several vessels. On the 11th they began their second parallel, only 300 yards from the fort. On the 14th two redoubts were carried by assault, one by American, the other by French troops. On the 16th the walls and fortifications of the British works were broken down and almost every gun dismounted. The British general attempted now to escape by night by way of Gloucester Point, but the attempt was frustrated by a furious storm, which scattered his boats. On the 19th he capitulated to the allies, the land army with its munitions to the Americans, the marine to the French. The prisoners, exclusive of seamen, amounted to more than 7,000, of whom 2,000 were sick or wounded. Among the spoils the Americans obtained 235 pieces of cannon, 8,000 stand of small arms, 28 regimental colors; the French 2 frigates and 20 transports. The total loss of the British was about 550, and of the allies 300. This victory virtually ended the war.—The second siege was begun by gen. McClellan, April 5, 1862. Gen. Magruder, with 15,000 men, had early in the spring erected formidable works around the town and strong works on Gloucester point. They were soon re-enforced by gen. Johnston, the total force numbering 50,000, and that of McClellan about 90,000. In the night of May 3 the rebels abandoned their works and retreated to Richmond, leaving 71 heavy guns. They were pursued, and on the 5th was fought the battle of Williamsburg.

YORK VON WARTENBURG, HANS DAVID LUDWIG, Count, 1759-1830; b. Prussia; entered the army in 1772; was cashiered for insubordination and imprisoned 1780-81, but reinstated in 1786. In the Russian campaign of 1812 he commanded the Prussian contingent in Napoleon's army, and made a convention with the Russians to be neutral. The convention was disavowed by the king of Prussia till he declared war against Napoleon. York distinguished himself in the campaign of 1813-14, and was made field-marshal in 1821.

YORUBA, or YARRIBA, a country of Guinea, w. Africa, lying to the e. and n.e. of Dahomey, in n. lat. 6° to 9°, and e. long. 2° to 6°. Its area is about 70,000 sq. m.; and the pop. is estimated at 2,500,000. Palm-oil, cotton, and ivory are the principal articles of export. Lagos (q. v.) is the port through which trade with foreign countries is chiefly carried on. There are numerous large towns in Yoruba, but the people are little if at all less barbarous in their customs than their neighbors of Dahomey.

YO-SEM ITE, YO-HAMITÉ, or AHWANNÉ, a valley and water-fall of California, in the e. of the state, about 57 m. from Coulterville, on a large feeder of the San Joaquin, and on the western side of the Sierra Nevada. The scenery of California is remarkable for its combination of loveliness with sublimity; and in no part of the country yet explored are these characters so strikingly displayed as in the Yosemite valley—a valley of from 8 to 10 m. long, and a little more than a mile wide; in some places filled with noble oaks, in others opening out into broad, grassy fields; with a river rushing through it about 40 yards in breadth; pine-covered mountains towering with very steep slopes to the height of 3,500 ft.; a precipice or "bluff" in one place rising perpendicularly 3,089 ft. above the valley; in another, a rock almost perpendicular, 3,270 ft. high; water-falls pouring over its sides from heights of 700 to almost 1000 ft.; and one great water-fall, broken into three leaps, but of which the whole height is 2,550 feet. Of the other water-falls on the sides of the valley, the Pohono, or Bridal Veil water-fall, is particularly to be remarked for its beauty as well as for its height, which is 940 ft., and almost unbroken. The Yosemite valley, first entered by white men in 1855, has begun to attract visitors since California has become peopled, and has already its hotels and guides, like the valleys of Switzerland and the falls of Niagara. See NATIONAL PARKS.

YOSHIDA KIYONARI, b. in Satsuma, Japan, about 1845. After careful education in Japanese and Chinese literature, he left Japan secretly for England in 1865. He spent two years in London and three years in the United States in study. Returning to Japan, he was appointed to the finance department, made internal revenue commissioner, and as vice-minister of finance negotiated a loan of \$12,000,000 in England. In 1874 he was appointed the first minister plenipotentiary to the United States. While on a visit to Japan in 1879 he entertained gen. Grant, and in 1880 returned to his post at Washington.

YOUATT, WILLIAM, 1777-1847; b. England; founded *The Veterinarian* in 1828. He was a veterinary surgeon, among whose works are *The Horse* (1831); *Sheep* (1832); *The Dog* (1842), and *The Pig* (1847).

YOUGHAL, a sea-port, parliamentary, and municipal borough of the barony of Innakilly, county of Cork, Munster, Ireland, situated in lat. 51° 57' n., long. 7° 52' w., on the estuary of the Blackwater, 157 m. s.w. from Dublin. The population, which in 1851 was 7,410, and in 1861 6,328, was in 1871 6,081, of whom 5,346 were Roman Catholics, 584 Protestant Episcopalians, and the rest of other denominations. The town has some structures of interest—the parish church, which is formed of the nave and aisles of the ancient collegiate church, built by the earl of Desmond in 1464; the "clock-gate;" and sir Walter Raleigh's house, which remains nearly in its original state. There is a handsome Roman Catholic church, as also churches of the several other denominations; two convents; several schools; a fever hospital, a lying-in hospital, and several other benevolent institutions. The trade of Youghal is considerable, but lies chiefly in the export of agricultural produce. The harbor, which is obstructed by a bar, does not admit vessels of more than 400 or 500 tons burden; the fisheries are extensive and valuable, and employ a considerable number of hands. There are several remains of buildings, civil, ecclesiastical, and military; and, according to the local tradition, the potato was first planted at Youghal, by sir Walter Raleigh. Youghal returns one member to the imperial parliament. The constituency in 1878 was 266. Its municipal affairs are managed by commissioners, 21 in number. The ratable value of property is £9,540.

YOUNG, ARTHUR, an eminent writer on agriculture, was born Sept. 7, 1741, and educated at Lavenham in Suffolk. In 1758 he was apprenticed by his father, a doctor of divinity and clergyman of the Church of England, to a mercantile house in Lynn. But Young had no liking for business, and devoted much of his attention to literature. On his father's death, in 1759, he undertook the management of a small farm of which his mother had a lease. Six years afterward he became a farmer on his own account in Essex. He seems, at the same time, to have acted as a parliamentary reporter; and as he only saw his farm from Saturday till Monday, it need not be wondered that he found it unprofitable. At the end of five years he gave £100 to a practical farmer to take the lease off his hands. In the mean time, however, he had made notes of the results of numerous experiments on his farm, which he afterward published, under the title of

A Course of Experimental Agriculture. His first successful book was *A Tour through the Southern Counties of England*, which was followed by other works describing the state of agriculture in various parts of England and in Ireland. The enthusiasm of Young and his lively style made his writings popular, and by them the knowledge of many judicious practices, confined to one locality, was spread throughout the whole empire. In 1784 Young began the publication of the *Annals of Agriculture*, of which 45 vols. were published. Three years later he was invited by count de la Rochefoucauld to make a tour in the south of France. What he saw induced him to undertake a series of tours in France, through a great part of which he traveled leisurely on horseback. The result was his most important work, *The Agricultural Survey of France*. The author did not confine his attention to agriculture, but described the social and political condition of the people in a lively and truthful manner, and his work has become, in consequence, the most reliable source of information regarding the state of France just before the revolution. In 1801 the French directory showed the value attached to the writings of Young by ordering the whole of his agricultural works to be translated into French. They were published at Paris, in 20 vols. 8vo, under the title of *Le Cultivateur Anglais*. In 1808 Young received a gold medal from the English board of agriculture, "for long and faithful services in agriculture." He died April 12, 1820.

YOUNMANS, EDWARD LIVINGSTON, b. N. Y., 1821. On account of blindness, from which he only partially recovered in later years, his education was acquired by the aid of his sister, who assisted him in scientific studies both by reading and experimenting for him. Notwithstanding the difficulties to be overcome he acquired a thorough scientific training, has published a *Class-Book of Chemistry*, *The Correlation and Conservation of Forces*, and other books, and is well known as a public lecturer on scientific subjects. He originated the plan of the *International Scientific Series*, of which a large number of volumes has been published, and in 1872 founded the *Popular Science Monthly*, of which he is still editor.

YOUNG, a co. in n. Texas, about 875 sq. m.; pop. '80, 4,727—4,638 of American birth, 17 colored; co. seat, Graham.

YOUNG, BRIGHAM, American Mormon leader, was born at Whittingham, Vermont, June 1, 1801, and was the son of a small farmer proprietor. In 1832, having become converted to Mormonism, he was made an elder of the church of the Latter-day Saints, and began to preach at the Mormon settlement at Kirtland, Ohio. In 1835 he was appointed one of the twelve apostles of the church, and sent as a missionary to the New England states, where he was very successful in making converts. After the Mormons had been driven from Kirtland to Missouri, and from the latter to Illinois, and the murder of Joseph Smith by a mob (1844), Young was chosen president in his place. The year following the charter of Nauvoo was repealed by the legislature of Illinois; and after a cannonade of three days the Mormons were driven from their capital and temple, and led by president Young to Utah, where they arrived, after a toilsome journey, July 24, 1847. Next year the great body of Mormons arrived and founded Salt Lake City; and in 1850 president Fillmore appointed Brigham Young governor of the territory for four years. In 1854, in consequence of the Mormons setting the federal laws at defiance by having in 1852 proclaimed polygamy as the "celestial law of marriage," edl. Steptoe was appointed governor in Young's place, but on visiting Utah he thought it an unsafe residence, and resigned. The Mormon president exercised supreme authority, and said, "I am and will be governor, and no power can hinder it until the Lord almighty says 'Brigham, you need not be governor any longer.'" In 1857 a new governor, Cumming, was appointed, and sent with a force of 2,500 U. S. troops to protect him and the federal officers; but Young forbade them to enter the territory, and cut off the supply-trains. A compromise was, however, effected, the Mormons paraded, and the troops remained until 1860. The determination of the United States to abolish polygamy, and the appointment, in 1869, of a new U. S. governor, contributed somewhat to reduce Young's authority. In 1874 his fifteenth wife petitioned the U. S. courts for a divorce, and separated from him. Young died Aug. 29, 1877, leaving a fortune of two million dollars to 17 wives and 56 children. See **MORMONS, SALT LAKE CITY, and UTAH**.

YOUNG, CHARLES AUGUSTUS, PH.D., LL.D., b. N. H., 1834; graduated at Dartmouth, 1853; till 1856 taught at Phillips academy, Andover, and from 1853 to 1866 was professor of natural philosophy and mathematics in the Western Reserve college, Ohio. In 1865 he was made professor of astronomy and natural philosophy in Dartmouth. For the last four years he has held a similar position in the college of New Jersey at Princeton. Prof. Young has made astronomical observations and discoveries of the highest scientific value. In observing the total eclipse of August, 1869, he discovered evidence that the corona is of solar origin, as proved by the bright line of the spectrum. He was a member of Winlock's party of 1870, and observed the total eclipse at Jerez, Spain. In 1872 he was sent out with a coast-survey party by the government, and demonstrated, by observations on the peaks of the Rocky mountains, the superiority of a great altitude for purposes of astronomical observation. He was assistant astronomer in Wat-on's expedition to Peking, China, to observe the transit of Venus, 1874. Prof.

Young has published many scientific papers, and has lectured on "The Sun" and like subjects.

YOUNG, EDWARD, the author of the well-known *Night Thoughts*, was born in the year 1684, at Upham, in Hampshire, of which parish his father was at that time rector. He was educated at Winchester school, and afterward, in 1703, went to Oxford. In 1708 a law fellowship in All Soul's college was conferred on him by archbishop Tenison. With law, however, he seems pretty much to have declined to meddle, occupying himself, by preference, with poetry and religious studies. In 1714 he obtained his degree of B.C.L.; and that of D.C.L. followed in 1719. Meantime he had come before the world as a poet, by publishing, in 1713, an *Epistle to George, Lord Lansdowne*, on his being created a peer. For Young, who continued through life one of the most persevering and audacious toadies that ever flattered a patron, this was a characteristic beginning. In the same year he also published two other poems of some length, entitled respectively *The Last Day* and *The Force of Religion, or Vanquished Love*; the year following he again flowed forth in *A Poem on the Death of Queen Anne*. These performances procured him some amount of immediate reputation. In 1719 he ventured on the more ambitious effort of a tragedy, which, under the title of *Busiris*, was brought out at Drury Lane. The piece had a fair success, through which means it probably was that he attracted the notice of the strange and eccentric duke of Wharton, with whom, in the end of that year, he was induced to go for a short time abroad. The duke seems to have entertained for him a real kindness, and to have treated him with much liberality. At the duke's death, Young set forth certain claims against his estates, which he succeeded in making good to the extent of an annuity of £200. The details of the case are perplexed, and need not here be entered into. They involve nothing dishonorable to Young, yet convey a somewhat unpleasing impression that the pious author of the *Night Thoughts*, in his extreme solicitude about the next world, contrived to keep a pretty sharp eye to his little pocket-interests in the present one. In 1721 was produced his tragedy, *The Revenge*, which, though unsuccessful at the time, has since had greater acceptance, and is the only one of his pieces still occasionally acted. His third and last attempt in this field, *The Brothers*, was produced in 1753. Between 1725 and 1728 appeared in succession his satires, under the title of *The Love of Fame, the Universal Passion*. These had a great success, and brought to their fortunate author money as well as fame. They abound with wit and vivacious observation, and even now will very well repay perusal. Of *The Instatement*, a poem, issued in 1726, and addressed to sir Robert Walpole on his being made a knight of the garter, it seems enough to say that, inasmuch as we incidentally hear from Swift of a pension granted him, we may surmise that this was the service to the public by which he had contrived to earn it. In 1727 Young, having taken holy orders for the purpose, was appointed one of the royal chaplains; and in 1730 he became rector of Welwyn, in Hertfordshire. The year after he married lady Elizabeth Lee, daughter of the earl of Lichfield and widow of col. Lee. He is supposed to have been very happy with her, as he exhibited great grief on her death in 1741. It is believed that from his solemn meditations on the event he got the suggestion of the *Night Thoughts*, begun shortly after, and published 1742-46. By this work almost solely it is that he has continued to be remembered. His mind retained its activity to the last. He published various other works, now so entirely forgotten that it would be waste of time to enumerate them; and in 1762 superintended a collected edition of his works, in 4 vols. 12mo, from which he had the grace to exclude certain of the most fulsome of his dedications, probably as having served their turn and not likely to be of further use. His death took place on April 12, 1765. Since that time his *Night Thoughts* has passed through editions innumerable, and is more or less familiar to every reader. It displays much gloomy force of pious reflection; and has passages of fine imagination, frequently somewhat marred by an epigrammatic mannerism of expression. Certain of its sententious lines have passed into common use and become in a manner proverbial. Though now somewhat declined from the estimation in which he was long held, Young must continue, on the strength of it, to hold a distinct and even high place in that interval in our literature which divides the artificial and so-called classical school of Pope from the return to a simpler and more natural manner, heralded some time afterward by Cowper. If we except his one great weakness of character—an inordinate appetite for preferment and worldly honors, which sought its gratification in ways somewhat servile and unworthy—there seems every reason to believe that Young was, on the whole, a very excellent and worthy man, and sincerely devout Christian.

YOUNG, JAMES, b. Scotland, 1811; for some time assistant in chemistry to Thomas Graham. About 1847 he began a series of analyses of petroleum, and succeeded in producing a lubricating oil for machinery and a lighter oil for lamps. He afterward took out a patent for a process of slow distillation of oil from coal. His discoveries showed the value of coal-oil and petroleum, and contributed to the development of the American oil-wells. He fitted out an expedition in search of Dr. Livingstone in 1872.

YOUNG, JAMES HAMILTON, b. Scotland, 1793; emigrated to the United States in 1801, and settled in Philadelphia. He was an authority on statistical matters as well as an expert engraver, and the Mitchell geographies were his work both in text and maps.

YOUNG, JOHN, LL.D., b. Scotland, about 1810; having studied theology became pastor of Albion chapel, Moorfields, and afterward of a church in Edinburgh. He is distinguished as a writer and has published: 1. *The Christ of History, an Argument grounded on the Facts of his Life on Earth*. The scope of the argument is that the existence on earth of such a person as Jesus Christ cannot be rationally accounted for except by admitting his claim to the possession of a divine nature. The later editions include an appendix containing a criticism on Renan's *Life of Jesus*. 2. *Evil and Good, the Mystery*. 3. *The Province of Reason, being a Critique on Mansel's Bampton Lectures*. 4. *The Life and Light of Men*. 5. *The Creator and the Creation, how related*.

YOUNG, THOMAS, M.D., one of the most ingenious and original philosophers of this century, and almost as eminent for his scholarship and his linguistic discoveries as for his contributions to science, was born at Milverton, in Somersetshire, on June 13, 1773. His parents, Thomas and Sarah Young, were Quakers of the strictest sect; and Young had the impression that the peculiar doctrines of the Quakers had a favorable influence upon his character and career. In particular, he connected with the Quaker doctrine of divine suggestion the perseverance with which he followed up any pursuit in which he engaged, to which he, like Buffon, was disposed to attribute all the discoveries which his genius enabled him to make. Wonderful stories of his youthful precocity have been recorded, and they seem to have more truth in them than such stories usually have. In 1780 he was sent to a boarding-school at Stapleton, near Bristol, where he remained two years; he was afterward put to school at Compton, in Dorsetshire, kept by a Mr. Thompson, who appears to have been an able and judicious teacher. When he left Compton, in his 14th year, besides having a great knowledge, for his age, of Greek and Latin and of mathematics, he had learned French and Italian, and, without any tuition, had made considerable progress in Hebrew, Persian, and Arabic. In 1787 he went to live with Mr. David Barclay, of Youngsbury, near Ware, in Hertfordshire, an eminent member of the society of Friends, partly as the fellow-pupil, partly as the tutor, of that gentleman's grandson, Hudson Gurney. A Mr. Hodgkin was called in to assist the studies of the two lads, but Young soon proved to be superior in acquirements to his instructor, and virtually the three became fellow-students. Mr. Hodgkin published in 1793 a work entitled *Calligraphia Græca*, which he dedicated to Young. Young continued to live with Mr. Barclay till 1792, spending the summer months in Hertfordshire and the winter in London, studying Greek and Latin, the modern languages, the oriental as well as the European, the higher mathematics, and natural philosophy, and, by way of amusement, botany and zoology. He taught himself to write Latin with fluency and elegance, and to write Greek verses, which received the commendation of some of the best judges of the time. During the winters of 1790 and 1791 he attended lectures on chemistry in London. It may be remarked that neither then nor at any subsequent time did he show much disposition toward experimenting; his bias seems to have been toward the pure rather than the observational sciences.

Toward the end of 1792, under the advice of Dr. Brocklesby, an eminent London physician, his mother's uncle, who had been greatly impressed by his abilities and attainments, he began to study medicine, and he attended medical lectures for two years in the schools of London, and afterward for a year at the university of Edinburgh. After going to Edinburgh, Young gave up the Quaker dress and the more inconvenient of the Quaker customs; he took lessons in music and dancing, mixed freely in society, and occasionally went to the theater. These changes, though not intended to go further, eventually led to his complete estrangement from the society of Friends. From Edinburgh he went to the German university of Göttingen, from which, after nine months' residence, he got the degree of doctor of medicine. He continued upward of a year longer in Germany, and visited various medical schools, returning to England in Feb., 1797. At that time the membership of the college of physicians was restricted to graduates of Oxford and Cambridge, and to qualify himself for it Young, on his return, entered as a fellow-commoner at Emmanuel college, Cambridge, at which he remained until he took his degree in 1799. In the year 1800, having become a member of the college of physicians, he took up his residence in London, and began to practice as a physician. He took the degree of M.B. at Cambridge, in 1803, and that of M.D. in 1807. His uncle, Brocklesby, who died in 1797, had left him £10,000, besides his house in London, with his furniture, library, and collection of pictures, so that he was in possession of a moderate competency.

In 1801 he was appointed professor of natural philosophy, in the Royal institution, then newly established, and he began to deliver lectures early in the following year. As a lecturer he was not popular, his style being too condensed, and the matter of his lectures unsuited to the miscellaneous audiences of the Royal institution. He published in 1802 a *Syllabus of a Course of Lectures on Natural and Experimental Philosophy*, in which, among other things, he first announced his great discovery of the law of the interference of light (see INTERFERENCE), which by itself, as Sir John Herschel has remarked, would have procured him a scientific immortality. It was this discovery which first fairly turned the balance of evidence in favor of the undulatory as against the molecular theory of light (see UNDULATORY THEORY OF LIGHT). It is Young's most important contribution to science. He had been elected a fellow of the Royal society as soon as

he was 21; in 1802 he became its foreign secretary, a post which he retained till the end of his life. He resigned his professorship on his marriage, in 1804, fearing that his filling a chair of science might interfere with his success as a physician. The lectures which he delivered as professor were the foundation of the *Course of Lectures on Natural and Mechanical Philosophy*, which he published in 1807—a great work, embodying a complete system of natural and mechanical philosophy, on which he was engaged for nearly five years. A new edition of these lectures was published in 1845, edited by prof. Kelland of Edinburgh. Young's doctrine of interference was at first unfavorably received by scientific men in England: it was attacked and ridiculed in the *Edinburgh Review*, and so little interest was taken in the subject, that of a pamphlet which Young published in answer to the *Edinburgh Review*, only a single copy was sold. As has often happened, the first recognition of the importance and ingenuity of this and others of Young's speculations came from the scientific men of the continent.

Young was admitted as a fellow of the college of physicians in 1808, and was elected one of the physicians of St. George's hospital in 1810. He afterward published several medical works, which, though they were little more than compilations, and are now forgotten, show that he was thoroughly versed in the history of diseases and of medical opinion. His hospital practice, too, is said to have been successful, but he had but little success in getting patients. He retired from practice—retaining, however, his connection with St. George's hospital—in 1818, on his appointment to be secretary of the board of longitude. On the dissolution of the board of longitude, he became the sole conductor of the *Nautical Almanac*, and afterward, when the system of life-insurance began to be popular, he held, along with this post, the office of scientific adviser of a life insurance company. During the last years of his life, he was a member of a council appointed to advise the admiralty in scientific matters.

Young's greatest achievement after his great discovery of the law of interference, was made in connection with the subject of hieroglyphics (q.v.). He was the first to hit upon the process of investigation by means of which the received interpretation of hieroglyphics has been arrived at. His discovery, originally published in papers written for the society of literature, and afterward in the *Encyclopædia Britannica*, was given to the world in a book in 1823. In his later years much of his attention was given to this and cognate subjects. He was engaged on an Egyptian dictionary at the time of his death. His miscellaneous writings, contributions to the transactions of learned and scientific bodies, to reviews, and the *Encyclopædia Britannica*, were very numerous. Three volumes of them, two consisting of scientific papers, edited by Dean Peacock, the third of hieroglyphical essays and correspondence, edited by John Leitch, were published in 1855.

He died after several months of failing health, and a short period of severe illness, on May 10, 1829. His character seems to have been singularly amiable, and to have endeared him to a multitude of friends, by one of whom, Dr. Peacock, dean of Ely, an ample biography of him was published in 1855. Young was, two years before his death, elected a foreign associate of the academy of sciences at Paris, succeeding to the illustrious Volta.

YOUNG MEN'S CHRISTIAN ASSOCIATIONS. George Williams first organized one in London, 1844, since which similar associations to the number of 1500 have been formed in various countries of Europe and America. The first one formed in America was in Montreal, 1851, and their increase has been greater in this country than in Europe. The number in the United States and Canada in 1875 was 519, with a membership of over 69,000. An international convention was formed of the associations of the United States and Canada in 1854. There have been eight conferences of associations of all lands. Though instituted and mainly controlled by members of evangelical churches, young men of good moral character are received as associate members, enjoying the privileges of full members, but not voting. In these associations it is sought by various agencies, as reading-rooms, lectures, libraries, classes of secular instruction, gymnasiums, employment-bureaus, as well as by Bible classes, prayer-meetings, etc., to promote the interests, secular, moral, and religious, of young men. Ladies' Christian associations were introduced in New York in 1857, in Boston, 1866, and there were in 1875 in the United States and Canada 47, with about 10,000 members, of which "19 have boarding-houses for young women, 19 industrial schools, 16 libraries, 17 assist in finding employment, 12 conduct Bible classes, etc."

YOUNGSTOWN, a city and co. seat of Mahoning co., Ohio, 135 m. n.e. of Columbus, on the Mahoning river, a station on branches of the Atlantic and Great Western and the Lake Shore and Michigan railroads; pop. '80, 15,431. The city is situated in the center of a coal and iron-mining region, and there are many rolling-mills, blast-furnaces, foundries, and factories. The principal buildings are the court-house, opera-house, and academy. There are 2 banks, 1 daily and 4 weekly papers, and 18 churches. The city was founded in 1800.

YPRES, or **YPEREN**, a t. of Belgium, formerly fortified, in the province of West Flanders, is situated in a fertile plain on both sides of the Yperlee, about 29 m. s.s.w. of Bruges (53 by railway). The marshes around the town at one time rendered it very unhealthy, but considerable improvement has been effected in this respect by drainage. Ypres was at one time one of the most important manufacturing towns in Flanders, the

number of inhabitants in the 14th c. being 200,000, and the number of looms 4,000. Its staple manufacture consisted of the cloth called, according to some, after the name of the town, diaper. The only remnant of its once flourishing manufacture is the Cloth-hall (*les Hottes*), standing in the great market-place, a building of prodigious size, in the form of a trapezium, in a rich style of Gothic architecture, and surmounted by a stately square tower or bellry, with a clock and chimnes. It was begun in 1230, and continued till 1342; the e. end, supported on pillars, being added in 1730. One of the wings is now used as the *hôtel-de-ville*, and other parts are occupied by different public establishments and concert-rooms. The cathedral of St. Martin is a fine Gothic edifice, with an altar of Carrara marble, a richly carved pulpit, and a picture doubtfully attributed to Van Eyck. Other buildings are the churches of St. Peter, St. James, and St. Nicolas, the old castle-ward, two colleges, several hospitals, barracks, numerous boarding and day schools, etc. The chief modern manufactures are thread, lace, lineus, woolens, cottons, silk, ribbons, leather, oil, soap, tobacco. There are many tanneries, oil-mills, salt-works, dye-works, breweries. The town is connected with the Yser by canal, and is a station on the West Flanders railway. Pop. 76, 15,515.

Ypres is a very old town, its origin dating from the 9th and 10th centuries. In 1688 it was strongly fortified by Louis XIV., and in the great European wars was frequently subject to sieges.

YPSILANTI, a city of Washtenaw co., Mich., 30 m. s.w. of Detroit and 8 m. s.e. of Ann Arbor, on the Huron river; the junction of the Michigan Central, and the Detroit, Hillsdale and South western railroads; pop. '80, 6,377. It contains the state normal school, with about 300 pupils, and several paper-mills, flour-mills, woolen factories, and canning factories. There are 2 banks, 3 newspapers, and 8 churches.

YPSILANTI, a Fanariot family, which falsely pretends to be descended from the imperial stock of the Comneni, has furnished various champions of the Christian population under Turkish rule. The first of these, **PRINCE CONSTANTINE YPSILANTI**, was born in 1760 at Constantinople, and for his translation of the works of Vauban, was raised to high official rank by sultan Selim III., and was subsequently appointed hospodar of Moldavia in 1799, and of Walachia in 1802. His administration of the government of these provinces was marked by wisdom and energy; but his ill-concealed sympathies with Russia led (1806) to his dismissal and flight to Transylvania. Re-established in the government of Walachia by the Russians, he showed his hatred for the Porte by inciting (1807) the Servians to insurrection; but finding soon after that his allies the Russians had views and aims quite inconsistent with his, and unable to strive with both Russians and Turks, he took the oath of allegiance to the czar, and retired to Kiev, where he died July 28, 1816. He has left numerous works, composed in Italian, French, and Turkish.

His three sons, Alexander, Demetrius, and Nicolas, followed up the same course of policy. The eldest, **ALEXANDER**, born in 1783, served for some time in the Russian army, and was chosen by the "Hetairists" as their chief in 1820. In promotion of the cause of Rouman independence, he collected a large sum by subscription in Russia, and afterward invading Moldavia, succeeded in raising an insurrection in both principalities. But, little suited by natural gifts to guide the movement he had originated, he was attacked by the Turks near Galatz, totally defeated, and forced to take refuge in Austria, where he was arrested and imprisoned. Released after a time, but broken in spirit by chagrin and privations, he retired to Vienna, where he died Jan. 31, 1823.—His younger brother, **DEMETRIUS**, who was born Dec. 25, 1793, also commenced his career in the Russian army, and joined his brother in his schemes for emancipating from servitude the Christian population of Turkey. Sent to Greece, armed with powers from his brother, he took a glorious part in the capture of Tripolitza (Oct., 1820), but was less successful in the following year in his attack on Euboea. His gallant defense of Argos against the Turks, stopped the victorious march of the latter, and gained (1823) for him the honorary titles of president of Argos, prince of the Peloponnesus, president of the legislative council, and senator. His stubborn resistance (1825) to the victorious Ibrahim at Napoli was another valuable service to Greece. In 1827, the grateful Hellenes made him commander-in-chief of their forces; but some difference arising between him and the president, Capo d'Istria, he resigned his post in Jan., 1830. He died at Napoli di Romania, Aug. 16, 1832. Ypsilanti was insignificant in appearance, but had the soul of a hero; and was as deaf to the allurements of pleasure as to the promptings of ambition.

YRIARTE, **IGNACIO**, 1620-85; b. Spain; the most distinguished Spanish landscape painter.

YSSEL, or **LIJSEL**, a river of the Netherlands, formed by the junction at Doesburg in Gueldres, of the Oude (*Old*) Yssel from Westphalia and the new Yssel, an offset of the Rhine, cut by Drusus. After this it flows n. and latterly n.w. past Zutphen and Deventer, forming part of the boundary between Gueldres and Oberyssel, and, passing Kampen, falls into the Zuyder Zee, after a course of about 80 m., forming at its mouth a delta, which is gradually increasing. The principal affluents are the Borket, the Schipbeek, and the Grift.—There is another river of the same name, a branch of the Rhine, in the province of Utrecht.

YSTAD, a sea-port t. in the extreme s. of Sweden, on the Baltic, in the lään of Malmöhus, and about 30 m. s.e. of Malmö. The town is well built, and has a handsome market place, 2 churches, a town-house, barracks, etc. There is a good harbor, and a brisk and improving trade is carried on, steamers plying to Stockholm, Lübeck, Kalmar, Stettin, Stralsund, and Copenhagen putting in here. It has manufactures of tobacco and snuff, chicory, soap, woollen cloths, and leather; there is also some ship-building. Pop. '76, 6,663.

YTTRIUM is a very rare metal, whose oxide is the earth of *yttria*, which is found in the Scandinavian mineral *gadolinite* (a silicate of yttria, glucina, and an oxide of cerium and iron), in *yttrotantalite*, and in one or two other very scarce minerals. Neither the metal, the oxide, nor the salts of the oxide are of any practical importance. According to Mosander, three bases have been confounded under the single name of yttria; to the most abundant of these he gives the name *yttria*, while he distinguishes the others as *erbia* and *terbia*.

YUBA, a co. in n.e. California, bounded s. by Bear river; about 600 sq.m.; pop. '80, 11,270—7,012 of American birth. Gold and silver are found. Co. seat, Marysville.

YUCATAN. See MEXICO.

YUCCA, a genus of plants of the natural order *liliacea*, natives of North and South America, and some of which are often cultivated in gardens on account of the singularity and splendor of their appearance. *Y. gloriosa* is a native of Virginia and of more southern parts of North America, but quite hardy in England. It has a stem about 2 or 3 ft. high, the upper part of which produces a great tuft or crown of large sword-shaped evergreen leaves, each terminating in a sharp black spine. From the center of this crown of leaves arises the flower-stalk, of 3 ft. or upward in height, branching out on every side so as to form a great panicle. The flowers are bell-shaped and drooping, white with a purple stripe on the outside of each segment of the perianth. The fibers of the leaves are used by the American Indians to make a sort of cloth and cordage.—The other species have a general resemblance to this in habit and appearance. The fiber of the *guceas* is similar to that of the *agaves* and *bromeliads*, and probably is often included under the name *pita flax* or *pita fiber*.

YUDHISHTHIRA. See PÂN'DAVAS.

YUGA (from the Sanskrit *yuj*, join; kindred to the Lat. *jung*-, the Gr. *zeug*-, Gothic, *juk*; hence, literally, junction) denotes, in Hindu mythology and astronomy, a long mundane period of years, which is preceded by a period called *Sandhyā*, "twilight," and followed by a similar period called *Sandhyā́m'sā*, "portion of twilight." Manu, the Mahābhārata, and the Purān'as name four such periods, three of which have already elapsed—viz., the *Kṛitā*-, *Tretā*-, and *Dvāpara-Yuga*; while the fourth, or *Kali-Yuga*, is that in which we live. The *Kṛitā-Yuga*, according to these works, consists of 4,000 divine years, its *Sandhyā* of 400, and its *Sandhyā́m'sā* likewise of 400 divine years. The *Tretā-Yuga* consists of 3,000, and its *Sandhyā* and *Sandhyā́m'sā* of 300 divine years each; the *Dvāpara-Yuga* of 2,000 divine years, with 200 such years to its *Sandhyā*, and 200 to its *Sandhyā́m'sā*; and the *Kali-Yuga* of 1000 divine years, with 100 such years to its *Sandhyā*, and 100 to its *Sandhyā́m'sā*. And since a divine year comprises 360 solar years of mortals, a year of men being a day of the gods, these Yugas, with their *Sandhyās* and *Sandhyā́m'sās*, would severally represent 1,728,000, 1,296,000, 864,000, and 432,000, or in the aggregate, 4,320,000 solar years of mortals—a period called *Mahāyuga*, or "a great Yuga;" 4,320,000,000 years being a day and night of *Brahmā*. See *KALPA*. The notion on which the theory of these Yugas and their *Sandhyās* and *Sandhyā́m'sās* is based, as may be easily inferred from the foregoing statement, is that of a descending progression, 4, 3, 2, 1, each of these units multiplied by 1000, and in the case of the periods preceding and following the *Yuga* by 100 years. The deteriorating process thus indicated in the succession of these Yugas, is also supposed to characterize the relative physical and moral worth of these mundane ages. "In the *Kṛitā-Yuga*," Manu says, "men are free from disease, attain all the objects of their desires, and live 400 years; but in the *Tretā* and the succeeding Yugas, their life is lessened gradually by one quarter." . . . "In the *Kṛitā-Yuga*, devotion is declared to be the highest object of men; in the *Tretā*, spiritual knowledge; in the *Dvāpara*, sacrifice; in the *Kali*, liberality alone." See also for other passages the article *KALIYUGA*. The present or *Kaliyuga* of the world commenced in the year 3101 B.C., when in the year 1867, therefore, 4,968 years of the *Kaliyuga* would have expired.—The term *Yuga* is sometimes also applied to other divisions of time. The *Vishṇu-Parān'a*, for instance, mentions, besides the Yugas above named, a *Yuga* which consists of a cycle of five years, called *Samvatsara*, *Parivatsara*, *Ikṣvatsara*, *Annavatsara*, and *Vatsara* (see Wilson's translation of this *Parān'a*, 2d ed., by Fitzedward Hall, vol. i. p. 49, ff.; vol. ii. p. 254, ff.); and a *Yuga*, or cycle of five years, is, as Colebrooke states (*Miscellaneous Essays*, vol. i. p. 106, ff.), likewise the cycle described in the astronomical treatises connected with the Vedas. The use of the term *Yuga*, however, in such a special sense is not frequent, whereas its application to the four mundane ages is that which generally prevails in the classical and mediæval Sanskrit literature.—For other works, besides those already referred to, which afford information on these and other divisions of Hindu time, see *Kala Sankalita*, a *Collection*

of *Memoirs on the Various Modes according to which the Nations of the Southern Parts of India divide Time*, etc., by John Warren (Madras, 1825); and *Cuneate Chronology, the Hindu and Mohammedan Methods of Reckoning Time Explained*, etc., by Charles Philip Brown (Lond. 1863).

YUKON RIVER. See ALASKA.

YULE, the old name (still in provincial popular use) for Christmas. It points to heathen times, and to the annual festival held by the northern nations at the winter solstice as a part of their system of sun or nature worship. In the Edda, the sun is styled *jagratheol* (fair or shining wheel); and a remnant of his worship, under the image of a fire-wheel, survived in Europe as late as 1823. The inhabitants of the village of Konz, on the Moselle, were in the habit, on St. John's eve, of taking a great wheel wrapped in straw to the top of a neighboring eminence, and making it roll down the hill, flaming all the way: if it reached the Moselle before being extinct, a good vintage was anticipated. A similar usage existed at Trier (see Grimm, *Deutsche Mythologie*, p. 586). The old Norse *hvel*, Ang.-Sax. *hweol*, have developed into *leel*, *hiol*, Swed. and Dan. *hjul*, Eng. *wheel*; but from the same root would seem to have sprung old Norse *jol*, Swed. and Dan. *jul*, Ang.-Sax. *geol*, Eng. *yule*,* applied as the name of the winter solstice, either in reference to the conception of the sun himself as a wheel, or, more probably, to his wheeling or turning back at that time in his path in the heavens. Goth. *hreila*, Eng. *while*, denote time as wheeling or revolving. The general nature of the festival, and the way in which the observances were overlaid, or transformed and masked by the Christian institution, are noticed under the head of CHRISTMAS. In the greenery with which we still deck our houses and temples of worship, and in the Christmas trees laden with gifts, we perhaps see a relic of the symbols by which our heathen forefathers signified their faith in the power of the returning sun to clothe the earth again with green, and hang new fruit on the trees; and the firmety still or lately eaten on Christmas eve or morning in many parts of England (in Scotland, the preparation of oatmeal called *sorrais* is used) seems to be a lingering memory of the offerings paid to Hulda or Berchta (q.v.), the divine mother, the northern Ceres, or personification of fruitfulness, to whom they looked for new stores of grain. The burning of the *yule-log* (or *yule-clog*) testifies to the use of fire in the worship of the sun (see BELTEIN).

YUMA, a co. in extreme s.w. Arizona, bounded s. by Mexico, w. by the Colorado river; about 10,000 sq.m.; pop. '80, 3,215—1890 of American birth. Gold, silver, copper, and lead are found. Co. seat, Yuma.

YUMAS, a tribe of American Indians on both banks of the Colorado river, near its junction with the Gila. The Spanish began settlements and missions among them in 1780, but the next year the Yumas massacred them. The number of the tribe was 3,000 in 1791, and is now only about 900. They are also known as the Cuchans. With some other tribes they were given a reservation of 200 sq.m. in 1865.

YUNG WING, b. near Macao, China, 1828, of humble, worthy parents; entered at 8 years of age the mission-school of Mrs. Gutzlaff; later, the Morrison school under the rev. S. R. Brown of America, and was by him brought to America in 1847. In the family of Dr. Brown's mother he became a Christian, and forthwith devoted his life to the welfare of China. He graduated at Yale college, 1854, having excelled in mathematics, metaphysics, and English composition. While there, he conceived a plan for having Chinese youth of promise brought to America for education. He returned, reaching China, 1855, a stranger, without money or influential friends, the language nearly forgotten, but with the aim to reach the imperial ear. For 16 years he studied, taught, served the government, acquired rank, and won to his views officers high in authority. In 1871 his plan was adopted by government, and the sum of \$1,500,000 granted. He was made chief commissioner of the Chinese educational mission, and has placed 112 selected Chinese young men under a 15 years' course of instruction in this country. He is now a mandarin of the second grade, intendent of the province of Kiang Su, and associate minister to the United States, Peru, and Spain. He resides at Washington.

YUNNAN, a province in s.w. China, s.e. of Tibet, drained by Santsam and Yangtse rivers; about 108,000 sq.m.; pop. between 5,000,000 and 6,000,000. Capital Yunnan.

YUNX, a genus of birds of the woodpecker family, a species of which, *yunx torquilla*, is called wryneck (q.v.). The *Y. torquilla* is the *ivix* of the Greeks. Aristotle has well described it and its long tongue, and the power of protruding and retracting it, as well as the writhing motion of its neck. It has been made familiar to readers of Greek by the adjuration in the second idyll of Theocritus (*Pharmaceutria*). The wryneck is the *torcol*, *tercon*, *turcot*, and *torcot* of the French; the *torcicollo*, *collatorito*, *capertorto*, *ver-tilla*, and *fornicula* of the Italians; *gjohtyta* of the Swedes; *natterwindl*, *wendhals*, and *drehals* of the Germans; long-tongue, emmet-hunter, snake-bird, cuckoo's mate, cuckoo-maid, and cuckoo-fool of the English; *gwddfdro* of the Welsh, and *arizui* of the Japanese.

YUTHIA, often written Ayu'hia, the ancient capital of Siam, is on an island formed by two arms of the river Menam, 54 m. above Bangkok. It was once a vast city, and

* In one of the Frisian dialects, *jule* or *jole* is used to signify a wheel.

contained immense buildings gorgeously ornamented. In 1767 the Burmans invaded Siam, and destroyed the city. It was rebuilt, and contains 40,000 inhabitants, including Chinese, Burmese, Siamese, and Malays. The river surrounds the city. The place is noted for its salubrity, and is a favorite summer resort for the merchants of Bangkok. Near the town is the famous Golden mountain, 400 ft. high.

YVERDUN', a t. on lake Neuchâtel, in the canton of Vaud, Switzerland; pop. about 6,000. It is the Ebrodunum of the Romans.

YVETOT, an old t. of France, in the department of Seine-Inférieure, is situated on an elevated and fertile plain, 32 m. n.e. from Havre, and 23 n.w. from Rouen by railway. The houses are mostly of wood, roofed with slates, the principal street being upward of 2 m. long; there is a well-planted promenade, but the town contains few objects of interest. There are manufactures of linen, cotton, calico, and velvet, and a considerable trade in cattle and agricultural produce. Pop. '76, 7,636. The lord of Yvetot is styled "roi d'Yvetot" in old chronicles, and antiquaries have been much puzzled to account for the origin of the title. There is a tradition that Clotaire, son of Clovis, having slain one Gauthier, lord of Yvetot, before the high altar of Soissons, endeavored to make atonement for the sacrilegious deed by conferring the title of king on the heirs of Gauthier.

YVON', ADOLPHE, b. Lorraine, 1817; studied painting under Paul Delaroche. He spent several years in Russia, and many of his historical pictures are of Russian events. His most noted work is the "Capture of the Malakhoff," 1857, executed on the spot. Other well known historical works are: "The Battle of Solferino," and "Magenta," and "The First Consul Descending the Alps." M. Yvon has also been very successful in *genre* painting and portraiture.

Z

Z, THE last letter of the English and other west European alphabets, had no place in the original Latin alphabet, but was adopted in the time of Cicero from the Greek along with *y* (*v*), and thus stood last. In Greek it had the sixth place, and had the power of a double consonant, being equivalent to *ds* or *sd*; in Latin its use was confined to words of Greek origin. In High-Ger., in which it is pronounced like *ts*, it corresponds to *t* in the Low-Germanic and the Scandinavian tongues, e.g., *zeit* = Eng. *time*. In Ital. *z* or *zz* mostly takes the place of the Lat. *ti*, as in *negozio* = *negotium*, *palazzo* = *palatium*, and is pronounced *ts*, or, preceded by *n*, *ds*. In Eng. and in Fr. it represents the flat sibilant sound of which *s* is the sharp. But in Eng., as in the vast majority of cases, *s* has always been employed to represent the flat sibilant sound as well as the sharp (e.g., in almost all plurals, as *bones*, *cards*, in words like *revise*, etc.), there is a tendency to drop the use of *z*, except in a few individual words, such as *size*, *prize*. Many maintain the use of *z* in words derived from the Greek, especially from verbs in *izō*, as *baptize*, and also in words formed on the analogy of these, as *legalize*; but even the advocates of this rule do not act on it consistently, and the mere English scholar is fairly puzzled. This is one of the points of English orthography most urgently calling for reform.

ZAANDAM', or **SAARDAM**, a t. in n. Holland, is situated on both banks of the Zaan, at its entrance into the IJ (a deep and narrow bay of the Zuider Zee), now converted into land intersected by canals, bearing rich crops. Zaandam lies 5 m. n.w. of Amsterdam on the other side of the bay. In former times shipbuilding was largely carried on, but has nearly ceased. The whale-fishing, which, in 1701, employed 35 ships, has been abandoned. There is still a considerable shipping-trade. The principal industries are sawing wood, preparing vegetable oil—chiefly from colza—manufacturing paper, grinding grain, mustard, dye-stuffs, snuff, etc., making starch, rope-spinning, and iron-founding. At a distance the town looks like a forest of windmills. Zaandam is a pleasant place, and many of the inhabitants are reputed to be wealthy. In 1697 Peter the great worked in one of the shipbuilding yards as a carpenter, and the house in which he lived is carefully preserved. It was visited in 1814 by the emperor Alexander of Russia, and is now inclosed with another building, to prevent exposure to the weather. There are two Dutch reformed churches, one Lutheran, two Baptist, and two Roman Catholic churches, a Jewish synagogue, and several institutions for orphans and old people. Two public schools, a school of design, and two poor schools are maintained by the town. Pop. '73, 12,036; '75, 12,346.

ZABERN (the Roman *tuberne*, tavern) is the name of three German towns on the w. side of the Upper Rhine, one of which was French till 1870. The first two are in the palatinate (Rhenish Bavaria)—viz., Berg-Zabern, a town of about 3,000 inhabitants, on the Erlebach, occupied chiefly with agriculture and some small manufactures; and Rhein-Zabern, about 4 m. further e., on the same stream, with little more than 2,000 inhabitants, noted for the two battles fought there and at the village of Jokgrin, about 2 m. further s., between the Austrians and the French, June 29 and Aug. 20, 1793.

The other, which, to distinguish it from these, is called Alsace-Zabern (French *Saverne*), till the war of 1870 in the French department Bas Rhin, is now capital of a circle in the German imperial territory Alsace-Lorraine. It is situated on the Zorn, which flows into the Rhine, on the Paris and Strasburg railway and highway, and also on the Marne and Rhine canal. The town contains a palace and college, and had in 1875, 5,774 inhabitants, employed in making cloth, pottery, leather, and hardware, and in the transport of wood, from the Vosges mountains. It belonged in the 12th c. to the bishops of Metz, and afterward to those of Strasbourg. There are still some Roman antiquities in the college. In 1696 the fortifications were razed. The stately palace was rebuilt by cardinal Louis de Rohan, famous in the story of the Diamond Necklace (q.v.); it served in 1817 and 1818 as barracks for the Austrian army of occupation; in 1852 it became a home for the widows and daughters of the members of the legion of honor; and now it is again a barracks. The surrounding scenery is rich in ruins and picturesque effects. A spiral walk, called the Zabern path, about 9 m. long, leads, with many windings and 17 covered bridges, to the top of the Vosges, from which the spectator looks down on Alsace as a garden. The pass of Zabern, or Saverne, which divides the Upper and Lower Vosges, is only 1325 ft. high. The railway, the canal, the Zorn, and highway, all run side by side along the charming valley; and there is a constant succession of bridges, embankments, viaducts, and tunnels throughout the 45 minutes' journey from Zabern to Saarbourg.

ZA'BISM. In the article on Sabæans (q.v.), we spoke chiefly of certain inhabitants of Arabia Felix, the "Sabaioi" of the Greeks, or "Sabæi" of the Romans. It appears that this name was, in the 4th c. A.D., superseded by that of Himyarites, and belonged to many tribes, that derived their descent from one Sabâ ("a descendant of Eber, or descendant of Noah"), who also was called Abd Shemesh—Servant of the Sun. These Sabæans, who considered themselves pure autochthons, in contradistinction to the immigrated tribes, have often been confounded with a number of other peoples of antiquity, and with professors of many forms of religious belief and speculation; in fact, the confusion that has sprung out of the unwieldy mass of information found respecting these many varieties, and which has been hopelessly mixed up by many generations of orientalists and theologians, is almost without parallel. We shall not here survey the manifold systems and theories that have been evolved from time to time, and handed down carefully, but we shall rather—in the main following Dr. Chwolson—enumerate the principal stages of Zabism as it appears, considered as a religious phase of mankind. We must premise that we exclude at once those imaginary Zabians who were taken by the mediæval Arabic, Jewish, and Persian writers to be identical with heathen or star-worshippers, as well as those who, like the ancient Chaldeans, the ante-Zoroastrian Persians, the Buddhists, etc., were vaguely called by that name by Mohammedan and other writers of the 12th century. These writers all start from the notion that idolatry, star-worship, and Sabæism were identical, and they called nearly all those who were neither Jews or Christians, nor Mohammedans or Magians, heathens or Sabæans. Zabism had then become, like Hellenism, from being a *nomen gentile*, an appellative. Confining ourselves to historical Zabism, we have to distinguish (1) the Chaldean Zabians of the Koran. These are the "Parsified" Chaldee heathens or non-Christian Gnostics—the ancestors of the present Mendaïtes, or so-called Joannes Christians, who live not far from the Persian gulf, and speak a corrupt kind of Chaldee-Aramaic; and (2) the Pseudo-Zabians, or Syrian Zabians (in Harran, Edessa, Rakkah, Bagdad), or, since 830-831 A.D., remnants of the ancient Syrian but Hellenized heathens. These disappear (as Zabians) since the 12th c., but perhaps still exist, under some other name, in Mesopotamia. It is these Pseudo-Zabians who spoke the most refined Syro-Aramaean dialect. They form the chief representatives of Zabism emphatically deserving of the name. The first-named, or Chaldean (Babylonian) Zabians, who transferred that name to the Harranic Zabians, and were of great influence upon the development of these latter's peculiar speculations, are the people meant under that designation by the Koran, and by the Mohammedans of this day. They are, as we said, also known as Christians of St. John, or Mendaïtes. Among the Nabathean heathens of the n.e. of Arabia and the extreme s. of Mesopotamia, near Wasith and Bassra, there arose, in the last decennium of the 1st c. A.D. a man named Elxai (Elchasai = Scythianus), born in the n.e. of Parthia (probably an adherent of Zoroastrianism, perhaps also acquainted with Buddhism), and spread among them Parsee ideas and Parsee religious rites and customs. They called themselves Mendaïtes—i.e., Gnostics. Many of their religious legends and tales they adopted at a later period from their Jewish and Mohammedan neighbors—chiefly, it is presumed, with a view of making themselves less hated by the ruling Mohammedan powers. They received the name of Ssabiin from their constant washings, and purifications and baptisms. Their Arabic neighbors occasionally translated this word into the Arabic *Al-Mogtasilah*, "those who wash themselves." About a hundred years after the foundation of this sect by Elchasai, Manes was born of Mendaïte parents, and was brought up among the Mendaïtes. He remained faithful to this creed up to his 24th year, at which period he founded the new sect of Manicheans (q.v.), which did not at first depart so considerably from Mendaïsm as it did at a later period (see MANICHEANS). To these aboriginal Zabians there succeeded, in 830 A.D., a totally different kind of sect under the same name—viz., the

Harranian Syrians. They themselves derived their denomination from one Zābī, who is variously called a son of Seth, son of Adam, or a son of Enoch or Idris, or a son of Methuselah, or of some fictitious Badi or Mari, a supposed companion of Abraham; while the Mohammedan writers, who, like the Greeks, endeavor to derive everything from their native tongue, either declare it to be derived from *saaba*, "to turn, to move," because they turned to the paths of untruth, instead of that of the true religion—i.e., Islam; or, as the Zabians themselves sometimes explain it, "because they have turned to the proper faith. Another Arabic derivation makes them take their name, still more absurdly, from a root *saabat* = to fall away from the proper religion, or to turn one's head heavenward—i.e., for the purpose of worshipping the angels and the stars, etc. European scholars have for the most part followed either Brooke or Scaliger, who variously hold the name to have sprung either from an Arabic root, which would point to their having come from the "east," or, again, from the Hebrew word for "host," viz., of heaven, which they were supposed to worship. The real state of the case, however, is that, whatever the derivation of the name, it did not originally belong to the Harranians, as we have stated already, but was assumed by them, for the purpose of evading the Mohammedan persecutions, from the people mentioned in the Koran.

But it is by no means easy to say who these so-disguised Harranians really were, and what, since it was neither Judaism, nor Christianity, nor Mohammedanism, nor Magism, their religion really consisted of. Former investigators mostly took them to have been a distinct race and people, and their religion to have been composed of Chaldaism, Parsism, Judaism, Christianity, Neoplatonism, Gnosticism, and cabalistic speculations. This, however, is far from being the fact. Broadly speaking, they might perhaps best be described as Syrians, who, partly descended from Greek colonists, had been subject so long to Syrian influences that they became in a manner Syrianized. Their religion was heathenism, the old heathenism of their Syrian fathers, which had, with incredible obstinacy, resisted not only Christianity, but rendered even Mohammedan ill-will harmless by stratagem. There can, however, be no doubt about certain foreign non-pagan elements having crept into it during the early Christian centuries. Eclecticism prevailed at that period, and it was not only Greeks and Romans that found the influence of foreign, chiefly eastern, metaphysical speculation irresistible. But apart from that peculiar syncretism, we find many other new additions to Harran idolatry in the shape of Zabism. There are, first of all, a certain number of legends about biblical personages from whom they pretend to be descendants—legends which, it may be presumed, they only, for the nonce, permitted to belong to their sacred traditions. There are further a number of laws of purity and impurity, and of sacrifices, which strongly remind of Judaism. Again, names of Greek and Roman gods, such as Helios, Ares, and Kronos, occur, a circumstance that perhaps may be explained from the prevailing tendency of the period of exchanging the names of native divinities for Greek and Roman names. Besides these foreign elements, there are certain metaphysical and physical views incorporated in their creed which are distinctly traceable to Aristotle, and finally, the theurgico-Neoplatonic religious philosophy of heathenism, such as is found in Porphyry, Proclus, Iamblichus, and the rest. All these apparently incongruous elements, however, infused into it by the circumstances of the period, do not prevent Zabism from being in reality heathenism. Were further proof needed, we should find it in the words of a celebrated Zabian, Thabit ben Korra, quoted by Barhebraeus, in the shape of a panegyric on the town of Harran and its heathenism, uttered, as Barhebraeus says, in his "purblind obstinacy." After speaking of Christianity—not to its advantage—for some time, Thabit rejoices over the blessings that still belong to his native place, Harran, through its having kept itself utterly unsullied by that faith. "We," he continues (the Zabians or Harranians), "are the heirs and progenitors of heathenism, which has once been gloriously spread over this globe. Blessed is he who bears his burden for heathenism's sake with firm hopes. Who has civilized the world and built its cities, but the nobles and the kings of heathenism? Who has constructed the harbors and has made the rivers navigable? Who has taught the hidden science? To whom else has the deity revealed itself, given oracles, and told the things of the future, but to the most celebrated men among the heathen? . . . Heathens have done all these things. They have brought to light the healing of souls; they have taught their salvation; they have also made manifest the art of healing the body; they have filled the world with institutions of government and with wisdom, which is the highest good. Without heathenism, the world would be empty and poverty-stricken, and swallowed up by great misery."

Without entering into a detailed account of the many sources whence our information is derived with regard to the creed itself, we shall briefly indicate that they are written in Arabic, in Hebrew, and in Greek. The former are the most copious; those in Hebrew are chiefly represented by Maimonides; and the Greek are ascribed to various pseudonymous writers, among whom figure Aristotle and Hermes Trismegistus. From their various, and, to a great extent, contradictory statements, we owe the following indications regarding the principal points of this creed: The Creator, it teaches, is in his essence, primitivity, originality, eternity, One; but in his many manifestations in bodily figures, manifold. He is chiefly personified by the seven leading planets, and by the good, knowing, excellent, earthly bodies. But his unity is not thereby disturbed. It is, the Zabians say, "as if the seven planets were his seven limbs, and as if our seven limbs

were his seven spheres, in which he manifests himself, so that he speaks with our tongue, sees with our eyes, hears with our ears, touches with our hands, comes and goes with our feet, and acts through our members." Nothing, we are told, is more foreign to Zabism than—what holds good of the creed of the Sabæans only—rude star-worship. Zabism according to the authority of Sharastani, expresses the idea that God is too great and too sublime to occupy him-self directly with the affairs of this world; that he therefore has handed over the ruling of it to the gods, and that he him-self only takes the most important things under his special care; that, further, man is too weak to address him-self directly to the Highest, that he therefore is obliged to direct prayers and sacrifices to the intermediate deities to whom the rule of this world is intrusted. Thus the veneration shown to planets, and even the worshiping of idols, is nothing but a symbolical act, the consequence of that original idea. There are many gods and goddesses in Zabism of this intermediate stamp. It is not the planets themselves, but the spirits that direct and guide them and deliver them which are taken as deities of this kind—deities that stand to the spheres in the relation of soul to body. Apart from these, there are those gods who cause or represent every action in this world. Every universal natural deed or effect emanates from a universal deity, every partial one from a partial deity that presides over part of nature. Everything that appears in the air, which is formed near the sky or arises from the earth, always is the product of certain gods, that preside over these manifestations, in such a manner that the rain in general, as well as every special drop of it, has a presiding numen. These spirits also mold and shape everything bodily from one form into the other, and gradually bring all created things to the state of their highest possible perfection, and communicate their powers to all substances, beings, and things. By the movement and guidance of these spiritual beings, the different elements and natural compositions are influenced in such a way that the tenderest plant may pierce the hardest cliff. He who guides this world is called the first spirit. These gods know our most secret thoughts, and all our future is open to them. The female deities seem to have been conceived as the feeling or passive principle. These gods or intelligences emanate directly from God without his will, as rays do from the sun. They are, further, of abstract forms, free of all matter, and neither made of any substance nor material. They consist chiefly of a light in which there is no darkness, which the senses cannot conceive, by reason of its immense clearness, which the understanding cannot comprehend, by reason of its extreme delicacy, and which fancy and imagination cannot fathom. Their nature is free from all animal desires, and they themselves are created for love and harmony, and for friendship and unity. They are not subject to local or temporal changes, and they rule the heavenly bodies, without finding the motion of the most heavy too heavy, or that of the lightest too light. Their existence is full of the highest bliss, through their being near to the Most High, whom day and night they praise, without ever feeling fatigue or lassitude, to whom they are never disobedient, but whose will they always fulfill with supreme delight. They have a free choice, and always incline to the good. "These spiritual beings, our lords and gods, are our intermediators and advocates with the Lord of lords and God of gods." All substances and types of the bodily world emanate from the spiritual world, which is the one from which everything flows, and to which everything returns, and which is full of light, sublime and pure. These two worlds correspond to each other, and are to each other like light and shadow. The way to approach these gods, and, through them, the highest essence, is by purifying our souls from all passions, by keeping a strict guard over our words and deeds, by fasting, heartfelt prayer, invocations, sacrifices, fumigations, and incantations. By steadfastly persevering in these and similar acts of devotion, man may reach so high a step of perfection that he may communicate even directly with the Supreme Power. The planets, as the principal representative and intermediate gods, are to be carefully observed, especially as regards—1, the houses and stations of the planets; 2, their rising and setting; 3, their respective conjunctions and oppositions; 4, the knowledge of the special times and seasons, the hours and days of the ruling of special planets; 5, the division of the different figures, forms, climates, and countries, according to their dominant stars—the prevailing notion of the Zabians being, like that of the Chaldees and the sect of the so-called Mathematicians (according to Sextus Empiricus), as well as of the Neoplatonists in general, that everything below heaven was subject, in a manner, to the influence of stars, or the spirits that inhabit and rule them. Every substance and every action, every country and every hour, has its special planetary deity. It is therefore well to study carefully the special conjunctions and figures, as well as the special mixtures of incense, which might cause the individual numen to be propitious. Thus, e.g., according to the Zabian belief, the first hour of Saturday stands under Saturnus, and it is therefore right and advisable to select at that time such prayers, seals, amulets, dresses, and fumigations as might be supposed to be particularly pleasing to that planetary god.

In order to address themselves to *visible* mediators, some of the Zabians are supposed to have directed their devotions to the stars themselves. But they soon found how futile a worship it was that addressed itself to things that appeared and disappeared in turn. They therefore manufactured permanent representatives of them in the shape of idols—idols wrought in as complete accordance as possible with the theurgical rules derived from the nature of the deity to be represented. They were of gold, to represent the

sun; of silver, to indicate the moon. The very temples in which they were placed were of as many corners as were supposed to correspond to the form of certain stars.

We know but little with regard to the cosmogonical notions of the Zabians. Sharastani, one of our principal authorities, only quotes "Agathodæmon" as his authority for their assuming five primeval principles, viz.: the creator, reason, the soul, space, the vacuum. Out of these, all things are composed. According to another source (Kathibi), however, the Zabians assumed two living and active principles—viz., God and the soul; further a passive one, matter; finally, two which are neither living nor passive—viz., time and space. Matter seems to have been held by them to be primeval and everlasting, and to it alone the existence of evil is attributable. God created the spheres only, and the heavenly bodies therein. It is these spheres (fathers) which carry the types or ideas to the elementary substances (mothers), and out of the combination, conjunction, and motion of these spheres and elements, the varying earthly things (children) are produced. Matter is, as we said, because of its defective nature, the source of evil, of ignorance, of folly; while the form is the source and fountain-head of the good, the right, the knowledge, and the understanding. Zabism further assumes a renewal of this world after each great "world-year,"—a space of 36,425 ordinary years. At the end of these periods, the plants, the animals, and the men that had existed within it, cease to propagate themselves, and a generation of each of them, different from all previous ones, springs into life. How far this theory is identical with the Babylonian, Egyptian, and Indian theories on the same subject, we cannot here investigate; suffice it to call attention to the striking likeness apparent in them all.

Man, the Zabians teach, is composed of contradictory elements, which make him the vacillating, struggling creature he is. Passions and desires rule him, and lower him to the level of brute creation, and he would utterly lose himself, were it not for such religious rites as purifications, sacrifices, and other means of grace, by which he may be enabled to approach the great gods once more, and to attempt to become like unto them. There are different kinds of souls; or rather man's soul partakes partly of the nature of the animal soul and partly of that of the angelic soul. The soul never dies, and punishments and rewards will affect only it, but not everlastingly. But rewards and punishments will not be wrought in any other future world, but in this, only at different epochs of existence. Thus, all our present joys are rewards for good deeds done by us in former epochs; and the sorrows and griefs we endure, spring in the same manner from evil actions we committed at former stages. As to the nature of the general (world-) soul itself, they say that it is primitive, for if it were not so, it would be material, as every newly created being partakes of the material nature. Yet a material soul would be an impossibility. "The soul, which is thus an immaterial thing," says Kathibi, "and exists from eternity, is the involuntary reason of the first types, as God is the first cause of the intelligences. The soul once beheld matter, and loved it. Glowing with the desire of assuming a bodily shape, it would not again separate itself from that matter of which means the world was created. Since that time, the soul forgot itself, its everlasting existence, its original abode, and knew nothing more of what it had known before. But God, who turns all things to the best, united it to matter, which it loved, and out of this union the heavens, the elements, and other composite things arose. In order that the soul might not wholly perish within matter, he endowed it with intelligence, whereby it conceived its high origin, the spiritual world, and itself. It further conceived through it that it was but a stranger in this world, that it was subject to many sufferings in it, and that even the joys of this world are but the sources of new sufferings. As soon as the soul had perceived all this, it began to yearn again for its spiritual home, as a man who is away from his birthplace pines for his homestead. It then also learned that, in order to return to its primitive state, it had to free itself from the fetters of sensuous desires, and from all materialistic tendencies. Free from them all, it would regain its heavenly sphere again, and enjoy the bliss of the spiritual world."

From all this, it will be seen, as we stated at the outset—that the Zabians, about whom so much has been theorized and fabled, were simply heathens who had to a certain extent adopted and modified Neoplatonic ideas, such as floated in the mental atmosphere of the early Christian centuries. It would be needless to enter into a discussion about the semi-fabulous personages to whom they ascribe the foundation of their creed, such as Agathodæmon, Arani, Hermes, and the rest; or some of those mentioned by other writers, such as Zerdusht, Nawassib, Orpheus, and the rest.

The life of this sect was but short. After having first been on terms of great friendship with the ruling powers of Mohammedanism as well as with Christians and Jews, and having filled many of the highest and most responsible posts at the courts of the caliphs, they were by degrees made the butt of fanaticism and rapacity. Muled, persecuted, banished at different periods, they disappear from history since the middle of the 11th century. Some obscure remnants of them seem to have survived in remote corners of Mesopotamia, but they, too, no longer adhere to the original creed, but are mixed up with the Mendæites, mentioned above, and the Shemsijeh, or sun-worshippers. Thus obscurely ended a sect which, for 200 years, had produced a host of men pre eminent in every branch of learning and literature, in philosophy, astronomy, history, natural history, poetry, medicine, and the rest. Many of these men, whose name and fame reached Europe, were confounded with their Mohammedan contemporaries,

chiefly because they lived in Bagdad, at that time the center of learning, the seat of the caliphs and the high dignitaries of state. The Mohammedans, however, had so high an appreciation of Zabian learning, that it became proverbial among them, and they could explain it only by tracing it to a supernatural source, notably to Hermes (Trismegistus), the father of the Zâbi, mentioned above.

We have in our sketch mainly followed Chwolson, who, aided by profound learning and acumen, has been the first to clear up the nature of Zabism, this terrible stumbling-block of many generations of investigators.—For detailed information on it and all the many-other points connected with it, we must refer our readers to the large work in which he has embodied the results of his investigations. *Die Sabier und der Sabismus* (2 vols. St. Petersburg, 1856). See also NEOPLATONISTS, GNOSTICS.

ZACATECAS, a state of Mexico, bounded on the n. by Coahuila, on the e. by San Luis Potosi and Aguas Calientes, on the s. by Jalisco, and on the w. by Jalisco and Durango; about 26,000 sq.m.; pop. '71, 397,495. The surface, which is intersected by a ridge of the Sierra Madre, is mountainous or hilly, with scanty supply of water. The soil in the valleys is fertile, and the climate warm, except in the higher regions. It is second in importance among the mining districts of Mexico, and silver is largely produced. Capital, Zacatecas.

ZACATECAS, capital of the Mexican state of that name, is situated in the windings of a deep valley or ravine, between high hills, about 320 m. n.w. of Mexico. It is built over a vein of silver, which has been deeply explored. The streets are narrow and crooked, but it has a fine appearance from a distance, owing to the size and massiveness of its churches and the elegance of some of its residences. There are also a college, a gunpowder mill, and a mint. Pop. 30,000.

ZACHARIAS, a Roman pontiff, successor of Gregory III. in 741, who is noticeable as one of the series of Greek prelates by whom the destinies of Rome and Italy were much influenced in the 7th and 8th centuries. The name of Zacharias, moreover, deserves honorable mention in connection with a work of benevolence and charity, which the Roman church afterward consecrated by intrusting it to a special religious order—viz., the redemption of captives from the pagan masters by whom they had been held in slavery. During the troubles arising out of the Lombard invasion, Zacharias, by his interposition in more than one instance in favor of the city of Rome with the Lombard kings, contributed to that prestige of the Roman see which eventually led to its obtaining the leadership of Italy, and in the end the temporal sovereignty of Rome and the adjoining territory. Zacharias died at Rome on Mar. 14, 752.

ZADONSK, a t. of Russia, in the government of Voronej, 50 m. n. of the town of that name, and about 230 m. s. of Moscow, on the left bank of the river Don. Pop. '67, 7,269. The trade of the town is not extensive, owing to the close neighborhood of the commercial towns Elitz and Voronej. The manufactures are insignificant. Zadonsk possesses a renowned cloister.

ZAFARAN-BO'LI, a t. of Asia Minor, in Anatolia, about 190 m. e.n.e. of Scutari, at the junction of two small affluents of the Chati-su. It has four handsome mosques, a church, large baths and khans, and extensive suburbs. It has a considerable trade in saffron (whence its name), which is cultivated extensively in the surrounding country. Pop. supposed to be about 15,000.

ZAFFRE, crude oxide of cobalt, made by roasting cobalt ore and reducing it to powder, with the addition of about three parts of the finest white sand used by glass-makers. It is extensively prepared in Saxony, and is often imported into Britain. When fused into a glass, it is intensely blue, and is much used by enamelers and porcelain manufacturers as a blue color.

ZAGAZIG, a t. of Egypt, capital of the province of Sharkieh; pop. about 40,000. It is 75 m. n.w. of Suez, on the canal leading to the isthmus from the Nile. Zagazig is the center of a great cotton trade, and is near the ruins of Bubastis.

ZAHN, JOHANN KARL WILHELM, 1800-71; b. Germany; educated at Cassel. He studied architecture and painting, lived for many years in Italy, and became professor at the Berlin academy of fine arts in 1829. His principal work is his *Die Schönsten Ornamente und Merkwürdigsten Gemälde aus Pompeji, Herculaneum und Stabii* (1828-63).

ZÄHRINGEN, a small village near Freiburg, in Baden, in the Breisgau, formerly a province of Austria, but annexed to Baden in 1805. It is historically noteworthy for the ruined castle from which the dukes of Zähringen took their name, the ancestors of the reigning house of Baden (q.v.). The Hapsburgs (q.v.) are traced to the same stock. Guntram or Gunthrun the rich, count of Breisgau—son of the famous Erchanger, who raised himself to the dignity of duke of Swabia and was beheaded for treason in 917—is assumed as the founder of the house of Zähringen. The Zährings claim to be descended from his eldest son, Gebhard; the Hapsburgs from the younger, Langelin. After the death of duke Berthold I., 1077, the house was divided into two lines—the ducal or Zähring line, which became extinct in the male line in 1218, with Berthold V., the founder of Bern; and the markgraf or Baden line, from which the present house of

Baden is descended. The ducal Zährings exercised a beneficent sway over a great part of Switzerland.

ZAIRE. See Congo.

ZAKRZEWSKA, MARIE ELIZABETH, b. Berlin, 1829; studied medicine, in which she became proficient. Leaving Germany on account of the prejudice against female physicians, she came to New York in 1853. Having taken a medical degree at Cleveland college, Ohio, she returned to New York, where, in association with the Blackwell sisters, she founded the New York infirmary, of which she was resident physician for two years, when she settled in Boston, where she established the New England hospital for women and children.

ZALA, a co. in s.w. Hungary, adjoining Croatia and Styria; about 1900 sq.m.; pop. 170, 333, 237. The surface is uneven, and heavily wooded. Wine, honey, and agricultural staples are the chief productions. Capital, Zala-Egerszeg.

ZALEUCUS, the celebrated lawgiver of the Epizephyrian Locrians in Southern Italy. Of his history nothing reliable is found, the ordinary account making him a slave-shepherd, who by his extraordinary abilities having obtained his freedom, became chief magistrate. Diodorus represents him to be of good family. It is said that the people applied to the oracle of Delphi for a remedy for prevailing disorders, and were commanded to make laws for themselves. These Zaleucus gave them, which he professed to receive from Minerva. They were given 660 B.C., 40 years before those of Draco, and were the first written laws possessed by the Greeks. His laws, though severe, were for a long time greatly celebrated, and so averse were the people to a change that if any one proposed a new law he was compelled to appear in public with a rope around his neck, and if his proposition was rejected he was immediately strangled. Adultery was punished with the loss of both eyes.

ZAMA, a city and fortress in Numidia, about 300 m. s.w. of Carthage, near which Hannibal was defeated by the younger Scipio, 201 B.C. The flower of Hannibal's forces consisted of a small veteran army, that had shared his fortunes for many years; most of the rest were of inferior quality, of many races, variously organized, and of suspicious fidelity. But his greatest deficiency was in cavalry, an arm with which he had repeatedly decided the victory in former battles. In Scipio's army, on the other hand, Numidians, under Masinissa, were present in overwhelming numbers. The onset of Hannibal's elephants, of which he had 80, was defeated and made worse than useless by the wise precautions of Scipio; the cavalry on his flanks were scattered by the furious charge of Masinissa and Laelius; his front line of mercenaries beaten back by the more numerous and better-disciplined Romans. His veteran infantry, hemmed in on all sides, fought with the courage of despair, and were cut to pieces. Hannibal having done everything, both before and during the battle, which could secure the victory, escaped with a few horsemen. Of the Carthaginians, 20,000 were left dead on the field, and an equal number taken prisoners. Of the victors, 2,000 fell in the action.

ZAMACOLS, EDUARDO, 1837-71; b. Bilbao, Spain; studied art at the Madrid academy, at Rome and Florence, and in Paris as a pupil of Meissonier. He became a *genre* painter of the first rank. Among his most popular pictures are, "Cervantes as a Recruit," "The Hunchback," "Bull Fighters Riding into the Arena," and "The King's Favorite."

ZAMBEZI RIVER AND REGION. The extensive region in s.e. Africa, known to mediæval geographers under the general name of the empire of Monomotapa, is shown on old maps as drained by a river called Zambese, or Zambere, on the banks of which appear large towns, of which the mythical "Vigita Magna" was supposed to be the most famous. The course of the stream, which is the modern Zambesi, is, however, pretty correctly delineated, and even a small lake is shown in connection with it, not far from the real position of lake N'gami, whose existence we only became aware of a few years ago, and which we now know may be considered one of the most southern collections of inland waters which communicate with the Zambesi river and the more eastern lakes. The Nyassa or Maravi, as well as the more northern lakes, Victoria N'yanza and Tanganyika (the latter in connection with the Nile basin), are also given with such a degree of accuracy that it plainly shows, that in compiling these early maps, the distinctive features of the region must have been well known—principally, it is supposed, from Arab sources, various settlements of that people inhabiting the e. and s.e. coast of Africa from the Red sea to Sofala.

Although the lower region of the Zambesi, for a distance of at least 300 m. from its mouth, has been in possession nominally of the Portuguese since the beginning of the 15th c., forming the captaincies of Riosdi Senna, Tete, and Quilimane, yet it is only within the last few years, through the indefatigable exertions of Dr. Livingstone (1851-56, and 1858-64), Mr. Oswell, Dr. Kirk, Mr. T. Baines, Mr. James Chapman, Charles Andersson, maj. Pinto, and other explorers, that we have got anything like an accurate or scientific idea of this vast region, which extends from 8° to 21° of s. lat., and from 14° to 37° of e. long.; and the total length of what may be considered the main stream (called Leambye in its upper course), from its mouth to the point shown on Dr. Living-

stone's map, where the Leeba river, which proceeds from lake Dilolo—on the summit of the water-shed which divides the rivers running n.w. into the Atlantic from those running s.e. into the Indian ocean—joins it, cannot be less than 1200 miles.

The river-basin of the Zambesi is coterminous, on the n., with a large area of the Congo river system, and the great lakes that drain into it; on the s. and w. an obscurely marked water-shed, crossing the Kalihari desert, separates it from the Orange river basin and the rivers that run through Ovampo land into the Atlantic; while on the s.e., a well-defined mountain-range divides the rivers flowing into the Zambesi from those which form the Limpopo river, running into the Indian ocean.

The name of Zambesi is preserved from the mouth of the river, or rather a short distance above it, to the junction of the main stream with the Chobe, in lat. 17° 31' s., long. 25° 13' east. Thence to its junction with the Leeba (Liba), coming from lake Dilolo, the Zambesi is called Lecambye (Liambai); and at the junction (lat. 14° 10' s., long. 23° 35' e.) it turns suddenly to the n.e. Part of the basin of the upper Zambesi was explored by maj. Serpa Pinto in 1878-79. Crossing from the w. several of the head-waters of the Cubango (Andersson's Okavango), formerly thought to connect with the Zambesi, Pinto found that the source of the Cuando (Kwando—Livingstone's Chobe), the chief tributary of the Zambesi, is about lat. 13° s. and long. 19° east. He passed several of its upper branches, and descended to the Lecambye by another tributary called Nhengo. The Cuando is a fine large stream, draining a large area of fertile country, and receiving several navigable affluents. Lake Dilolo, from which the Leeba flows, seems to have an outlet both to the n. and to the south. The northern outlet probably runs into one of the tributaries of the Congo.

In the region where the Leeba joins the Lecambye the main stream is often as wide as the Thames at London bridge, and perhaps as deep. From the confluence to the Victoria falls there are many long tracts over which vessels as large as the Thames steamers could freely ply. But there are serious obstacles in the way of anything like navigation for hundreds of miles at a stretch—as seems now to be possible on the Congo (Livingstone) above the Yellala falls. Large areas in this region are liable to be flooded, and to stand under water for considerable periods at a time.

This part of central s. Africa may be considered as an extensive plateau or table-land, from 3,000 to 4,000 ft. above the sea-level, with an outer fringe or border of basaltic rocks, cutting through which the Zambesi river forms one of the most striking scenes in the physical geography of the universe—namely, the Victoria falls of Livingstone, or Mosiotunya, or "Smoke sounds there," of the natives. Here, a few m. to the e. of where the Chobe joins the Zambesi, the latter—a stream of 1000 yards in width—plunges down into a chasm more than 100 ft. deep, forming an immense crack in the basaltic rock at right angles to its course, and is carried along in a narrow channel some 30 m. in the same direction. Within a distance of 220 m. above the falls the river has 72 cataracts and rapids.

The Cubango (the Okavango of Andersson), draining a large district of the Benguela highlands, was supposed to run into the Zambesi; but according to Pinto it passes through lake Ngami, and emerging as the Botletle, ends in the Makarikari, an enormous basin into which many rivers run and are evaporated. In its lower course the Zambesi varies in width from 500 yards to 2 m. and more, in the rainy seasons. From the Portuguese town of Tete downward it is navigable, although with difficulty in the dry season; and it passes through one or two narrow rocky gorges in the Lupata mountains, which form ugly rapids, except when the river is in full flood. About 30 m. from the mouth it receives from the n. the water of the Shiré, which runs out of lake Nyassa, the Maravi of old geographers, an extensive sheet of water above 300 m. long, and 50 m. across at its widest part, extending between lat. 11° and 14° 30' s., and it enters the low country about 50 m. from the ocean, where it divides into many branches, forming a large delta, of a very unhealthy character. The most northern stream is called the Kwaka, or Kilimane, or Quillimane river; and the most southern and deepest channel, the Luabo. At the Kilimane, or Quillimane, about 18 m. from the sea, is the residence of the Portuguese governor of the region; but there are various other entrances used by slavers and contrabandists, which are not very accurately laid down in our charts; and it is both difficult and dangerous to enter the river without a competent pilot.

The Victoria falls are estimated to be 2,500 ft. above the sea-level. Tete is considered to be 490 ft.; and the rapids of lake Nyassa, where the Shiré issues from it, are 1552 ft. above the same; while lake Shirwa, a smaller lake, s.e. of Nyassa, is 2,600 feet.

The natives inhabiting the coast region drained by the Zambesi must be considered of the pure negro type; while the Makololo, who were found in the central and upper country, belonged to the Betjuana family. According to maj. Pinto this tribe has now ceased to have a separate existence. In the reign of the third king of a dynasty of conquerors, the Luimas, the former masters of the country, again came into possession, and early in 1878 the remaining Makololos were put to death. On the upper Zambesi, between the Cuando and Cubango, maj. Pinto discovered the Mucasse-ngares, a tribe of Ethiopian origin, of a yellowish-white color. The Zuin tribe of Anatabele, under Mosilaketze, who inhabit the high region dividing the Limpopo from the Zambesi basin, have overrun and conquered nearly all the tribes s. of them. The slave-trade is actively carried on in the countries nominally claimed by the Portuguese; unsuccessful attempts

were made a few years ago to plant an episcopate and civilize the natives, through the influence of missionaries.

All the usual tropical productions are found, but, owing to the disturbed state of the native tribes, are but little cultivated. The animal kingdom is very similar to that of the adjacent regions of s. Africa; and an immense quantity of ivory is exported both from the w. and e. coasts. The prevalence of the tsetse (q.v.) makes traveling difficult in the interior. Extensive coal-fields exist, and gold is found in the neighborhood of Tete and Senna.—See the *Travels* of Livingstone; T. Baines's *Explorations*; Andersson's *Okavango*; To the *Victoria Falls of the Zambesi*, by Ed. Mohr (London, 1876); and *Proceedings of the Geographical Society* (1879).

ZAMIA, a genus of plants of the natural order *cycadaceæ*, of which the species are found in the tropical parts of the world. They have a tree-like stem, with a single terminal bud and pinnate leaves. The wood consists of concentric circles, with very loose cellular zones between them. The male and female flowers are on separate plants, in tessellated catkins, the scales of which differ in form in the male and female plants. The central part of the stem contains much starch, especially in old plants, and a kind of sago or arrowroot is made from some of them. The central part of the stem of the bread-tree (*Z. cycadis*) of s. Africa, which is about 6 or 7 ft. high, with a scaly stem, is much used as an article of food by the Kaffirs and Hottentots, who prepare it by wrapping it in a skin well rubbed with grease, burying it in the ground until it undergoes putrefaction, bruising it between two stones, making it into cakes, and baking it in wood-ashes. There are numerous fossil species of *zamia*. Closely allied to it is the fossil genus *zamites*.

ZAMIOSTROBUS, the generic name given to several cones from the secondary and tertiary strata, because they were supposed to be the fruits of fossil *zamia*s. But Mr. Carruthers has shown (*Journal of Botany*, Jan., 1867) that they belong to true coniferae. He has, however, in the same paper, described six species of fruits belonging to *zamia*-like cycads, to which he has given the generic title of *cycadeostrobus*. They are all from the secondary rocks. No cycadean remains whatever have yet been found in newer deposits.

ZAMITES, the generic name under which are included numerous forms of *zamia*-like leaves which occur in secondary strata. No certain traces of the trunks have yet been found associated with them, and only one species (*Z. gigas*) is accompanied with fruit, and this is so anomalous that it casts considerable doubt on the determination of the affinities of the foliage.

ZAMOJSKI, ANDRZEJ, Count, 1716-92; b. Zamosc, Poland; served for a time in the Saxon army, and reached the rank of maj. genl. He was one of the first nobles to emancipate his serfs. He was grand-chancellor to Stanislas Augustus, and, in 1776, drew up a code of laws. This was adopted in 1791, before which time dislike to its liberal measures for securing emancipation of the serfs had prevented its adoption.

ZAMOJSKI, ANDRZEJ, 1800-74; b. Poland; the grandson of gen. Andrzej Zamojski; educated at Geneva and Edinburgh. In 1823 he entered the Polish civil service, and in 1830 was minister of the interior to the revolutionary government. After the failure of the patriotic movement Zamojski remained on his estates, freed his serfs, carried on an agricultural paper, started a private bank, introduced steam-navigation on the Vistula, and was at the head of a great agricultural association regarded with disfavor by the government. In 1862 he was banished, and the rest of his life was spent in Paris.

ZAMOJSKI, JAN, 1541-1605; b. Poland; educated at Strasburg and Padua. Henry of Anjou, on his accession to the Polish throne in 1572, made him grand-chamberlain. When Henry gave up the throne, Maximilian II. of Austria was chosen king by a party of the nobility. Another party, whose leader was Zamojski, succeeded in making Stephen Báthori of Transylvania, king, who appointed Zamojski grand-chancellor. He was commander-in-chief during the war with Russia, 1580-82, and secured favorable terms of peace. His influence with Báthori, whose niece he had married, made him unpopular, and he took but little part in public affairs. On the death of Báthori he procured the election of Sigismund III., though he himself might have been king. The latter part of his life was spent in fighting the Turks, Tartars, Swedes, and other nations. He was a munificent patron of literature.

ZAMORA, a province in n.w. Spain, once part of the kingdom of Leon, bordering on Portugal, and on the provinces of Salamanca, Leon, Valladolid, and Orense; 4,135 sq.m.; pop. '79, 250,968. The surface is level and fertile; grain, fruit, and wine are the chief products. Antimony and lead containing some silver are found. Capital, Zamora.

ZAMORA, a very ancient t. of Spain, capital of the province of that name, is situated 40 m. n. of Salamanca, and 132 n.w. of Madrid, on the right bank of the Douro, which is here crossed by an old stone bridge. It is the see of a bishop suffragan of Santiago. Zamora was of great importance in the Moorish times, and is said to have been inclosed by seven lines of walls, with a moat between each. It is entered by seven gates, is surrounded by a wall, has a massive square tower with Norman arches, and many interesting remains of mediæval architecture. *La Magedena*, a church of the Templars, but

afterward belonging to the order of St. Juan of Jerusalem, is a simple solid edifice of the 12th c., slightly modernized. There are 20 other churches, besides a theological school, barracks, a prison, a normal and other schools, a library, museum, etc. It has manufactures of serges, linens, leather, hats, liqueurs, brandy, and a considerable trade in wine and grain. Sir J. Moore urged the Junta of Salamanca to repair the defenses of Zamora, and receive there his stores; but his retreat had commenced before they had done deliberating. Had Zamora been made tenable, Moore would have fallen back on it, instead of on Corunna. The French afterward got possession of it, and although no resistance was made, the town was sacked, neither age nor sex was spared, and the principal persons were executed. It was again plundered by the French, and has never recovered these visitations. Pop. 10,000.

ZAMOSC, one of the most strongly fortified towns of Russian Poland, in the government of Lublin, 45 m. s.e. of Lublin, and 140 s.e. of Warsaw, surrounded by water and a marsh. All the houses are built in the Italian style with arcades. There is a large and beautiful castle opposite the former university, town-hall, and arsenal, four churches, monasteries, theater, etc. There are beer and porter breweries. Pop. '67, 6,467.

ZAMOUSE, *Bos brachyeros*, a species of ox or buffalo, found in the tropical parts of western Africa. It is the *bush cow* of Sierra Leone. It differs from the buffalo and all other *bovidæ* in several important particulars, especially in the very large size and peculiar fringing of the ears, and in the total want of dewlap. The forehead also is flatter than that of the buffalo. The color is nearly uniform—a pale chestnut. The hair is thin, and nearly erect. The ears have three rows of long hairs springing from the inside, and a tuft of long hairs at the tip. There is a considerable space on the forehead between the horns, which are not long, extend outward and upward, are suddenly incurved, and very sharp.

ZANE, EBENEZER, 1747-1811; b. Va.; built about 1770, at what is now Wheeling, a block-house, which was several times unsuccessfully assaulted by the Indians during the revolution. He held a number of civil and military offices. His settlement was the earliest permanent one on the Ohio. The land on the Muskingum river, where Zanesville, now stands, belonged to him.

ZANESVILLE, a city of Ohio, on the left bank of the Muskingum river, and opposite the mouth of Licking river, 54 m. e. of Columbus, is a regular well-built town, in a beautiful and fertile valley, with steamboats to the Ohio, and several railways. An iron railway bridge of 538 ft. crosses the river, and bridges connect it with its suburbs—Putnam and South and West Zanesville. It has abundant water-power, and rich coal and iron mines; cotton, woolen, nail, and glass factories; iron foundries, 22 churches, public and free high schools, 5 or 6 newspapers, etc. Pop. '60, 9,229; '70, 10,011.

ZANESVILLE (*ante*), the co. seat of Muskingum co., on the Cincinnati and Muskingum Valley, and the Baltimore and Ohio railroads; pop. '80, 18,120. The streets are wide and lighted with gas. The water supply comes from the Muskingum, and is stored in a reservoir with a capacity of 2,000,000 gallons. The river is navigable to the city by steamboats. Among the manufactures are flour-mills, engine and boiler factories, steam-engine factories, rolling-mills, paper-mills, tile factories, and soap-works. It was the capital of the state, 1810-12.

ZANGUEBAR. See ZANZIBAR.

ZANTÉ (ancient *Zacynthus*), one of the principal Ionian islands, about 9 m. from the w. coast of the Morea, and 8 s. of Cephalonia, is about 24 m. long, 12 broad, and has a superficies of 156 sq. miles. The greater part of the island consists of a plain, stretching from n. to s., with a breadth of from 6 to 8 m., bounded on the w. by a line of hills. The vine is extensively cultivated on the plain, and the wine produced is considered to be of a superior quality. Currants produced from a dwarf species of vine, originally brought from Corinth, are the staple product, 14,255,764 lbs. being exported in 1876. Pomegranates, olives, melons, peaches, and citrons also are grown. Zante is said to have been colonized by Achæans from the Peloponnesus; and it is mentioned in Homer with the epithet "woody," which, however, is not apt at the present day, although it is justly called, in an Italian proverb, "the flower of the Levant." It is subject to frequent earthquakes, which, it would seem, are likely to recur about once in 20 years. The most notable mineral feature of Zante is its pitch-wells, described by Herodotus, which are situated about 12 m. s. of the town of Zante, in a marshy district. Pop. '71, 44,557.—**ZANTE**, the capital, is the largest town in the Ionian islands, and is situated at the head of a small bay or harbor on the e. coast, on the site of the ancient town, of which the only remains are a few columns and inscriptions. The houses stretch along the semi-circular outline of the bay to the distance of a mile and a half, and extend up the slope of the castle hill. Most of the streets are narrow, but clean, and the older houses built in the picturesque Venetian style; the huge lattices of wooden frame-work, resembling those employed in eastern harems, with which the windows used to be fitted, are being rapidly abolished. The principal street is broad and handsome; the churches are numerous, and the market-place spacious. The harbor of Zante has been greatly improved of late years; it is now protected by a long mole, and has a light-house, but is still some-

what exposed and insecure. A magnificent and extensive view is obtained from the citadel in the highest part of the town. Zante is the see of a Greek protopapas, and of a Roman Catholic bishop. Pop. 20,000.

ZANZIBAR, or **ZANGUEBAR**. The territories of the sultan of Zanzibar comprise all that part of the e. coast of Africa included between Magdashooa, situated in 2° n., and cape Delgado in $10^{\circ} 42'$ s. lat. They are bounded on the n. by the independent tribes of Somal and Gallas, and on the s. by the Portuguese province of Mozambique. The extent of the coast is about 1100 m. and parallel to it are numerous islands, the most important of which are Zanzibar, containing the capital of the same name, Pemba, and Máfia (Montfia on the charts). The territories on the main-land have no defined limit toward the interior, being occupied by heathen tribes, over whom the sultan's authority is hardly even nominal beyond the sea-board. The soil along the coast is fertile in rice, millet, peas, beans, melons, pumpkins, the sugar-cane, cocoa-nut, banana, plantain, etc., and the forests supply the caoutchouc tree and many valuable species of timber. Cattle, sheep, and fowls are plentiful, and tropical wild animals abound. Rice, sugar, molasses, ivory, gums, gold, and cowries are exported. The heat on the coast is excessive, and the climate very unfavorable to Europeans. The name Zanzibar is applied to the coast from 4° n. to 12° south.

The island of Zanzibar, by far the richest and most important part of the sultan's dominions, is distant from 20 to 30 m. from the African coast; it is about 48 m. in length and from 15 to 30 in breadth. It contains an area of about 400,000 acres, and the soil is in most parts of exceeding fertility; being covered with woods and plantations, and the frequent rains causing perpetual verdure, it everywhere presents a delightful appearance. It is very flat, the highest point being not more than 300 ft., composed entirely of coral, and abundantly watered by rivulets, which flow at all seasons of the year. The principal products are cocoa-nuts, cloves, rice, sugar-cane, manioc, millet, and fruits in the utmost abundance, especially oranges of the finest quality, which can be purchased at the rate of 1000 for four shillings. The island is intersected by paths and green lanes in every direction, affording a never-ending variety of pleasant walks and rides. The country-houses of the Arab proprietors and the huts of their slaves are thickly dotted over the surface, surrounded with gardens and fields. The hedgerows are covered with flowering creepers, and pine-apples grow among them in wild profusion. In many parts are glades of undulating grass-land, of park-like appearance, dotted with gigantic mangroves; the ponds are covered with rushes and water-lilies; and the air is perfumed with the blossoms of the orange and clove. The pop. of the island is estimated at about 100,000. The town contains about 60,000 permanent inhabitants, while probably from 30,000 to 40,000 strangers come from Arabia, India, and the northern parts of Africa during the season of the n.e. monsoon. The chief people are the Arab landed proprietors, who form a sort of aristocracy, possessing large plantations and numerous slaves; besides these, there are slaves, free blacks, natives of the Comoro islands and Madagascar, and from 5,000 to 6,000 natives of India, who keep nearly all the shops in the town, and through whose hands nearly all the foreign trade of the place passes. The language of the court and of the Arab population is Arabic, while the slaves and the free black population speak a dialect called *Kiswahili*, one of the great family of South African languages.

The climate of Zanzibar is extremely equable and salubrious, the thermometer having probably never risen as high as 90° , nor fallen lower than 70° . Nearly 200 in. of rain. fall during the year, of which half at least falls in March, April, and May.

The capital is extensive, but, like most oriental towns, it is narrow, irregular, and ill built; the houses of the principal inhabitants and of the European residents are large flat-roofed buildings, generally with an interior court-yard, and some of them, and especially the palace of the sultan, may almost claim to be magnificent.

The trade is very considerable. In 1875 it was estimated as follows: Imports, £600,000; exports, £550,000. The imports consist of cotton goods, brass wire, beads, arms, etc.; and the exports of gum-copal, cloves, ivory, cocoa-nut oil, sesame, dye-stuffs, and a great variety of other articles.

The sultan has a small standing army of about 1400 paid soldiers, capable of increase by conscription and recruiting. The fleet, which in 1871 consisted of a sailing frigate of 24 guns, 1 corvette (21 guns), 1 steam corvette (9), and 2 yachts (6 and 4 guns), was almost entirely destroyed in the hurricane of 1872. The earliest settlement of Arabs on the e. coast of Africa occurred about 924 A.D.; and for several centuries flourishing republics, governed by elders, elected by the citizens, existed along the coast. Vasco da Gama visited Zanzibar in 1499, and in 1503 the dominion of Portugal was recognized by the inhabitants, who agreed to pay an annual tribute; but the Portuguese never held it for very long periods. About 1735 A.D. they were finally expelled, and in 1784 the island was taken by the imam of Muscat, in whose family the government remained until the death of Seyed Saed bin Sultan, in 1854, when the Arabian possessions fell to his son Seyed Thoweni, and Zanzibar and its dependencies to Seyed Majid (died 1870), elder brother of the present ruler, Seyed Barghash, who has entered into treaties with Great Britain for the suppression of the slave-trade, and who visited England in 1875.

ZARA (ancient *Jadera*), the chief t. of Dalmatia, on the coast of the Adriatic, 73 m. n.w. of Spalatro, and about 128 s.e. of Trieste. Till 1873 Zara was strongly fortified. It is built in the form of an oval, on a narrow promontory, separated from the mainland by a moat, across which is a draw-bridge. The town is entered by two gates, one from the sea, called Porta-Marina, supposed to be partly of Roman construction; and one from the landward side, called Porta-di-Terra-Firma. The ramparts, of Venetian construction, and partly planted, afford a fine promenade to the inhabitants. There is a spacious and well-protected harbor, which, however, is somewhat shallow. The streets generally are narrow and ill paved, and the drainage defective; the town is not well supplied with water. Of its churches, the most noteworthy are its cathedral, founded by Henry Dandolo, doge of Venice, and the church of the patron saint, St. Simeon. There are many convents and monasteries; a lyceum, gymnasium, and other schools; a barrack and a naval and military arsenal; hospitals, a theater, museum, and other public buildings. There is a lofty marble column, which is all that is left standing of an ancient Roman temple; there are also the remains of a Roman aqueduct. Zara is the seat of the government of Dalmatia and the see of a Roman Catholic archbishop. The commerce is unimportant. Many of the inhabitants are engaged in fishing and in the coasting-trade. The chief manufactures are rosoglio, maraschino, leather, silk, and linen fabrics. Pop. '69, 8,014, Italians by descent, and speaking the Italian language. Anciently, Zara was the capital of Liburnia, in Illyricum; and under Augustus it was made a Roman colony.

ZAPATA, a co. in s.w. Texas, separated from Mexico by the Rio Grande; 1425 sq.m.; pop. '80, 3,634—1311 of American birth; 14 colored. Stock-raising is the principal occupation. Co. seat, Carrizo.

ZARAGOZA. See SARAGOSSA.

ZARAIISK, a Russian t. in the government of Riazan, 32 m. n.w. of the town of Riazan, and 80 s.e. of Moscow, a few miles from the right bank of the Oka, a tributary of the Volga. The town was founded in the 13th c.; and in 1531, Ivan the terrible erected on the site of the old fortifications a strong fortress, which thrice resisted the assaults of the Tartars, and which still exists. Another noteworthy object is the cathedral of St. Nicolas, which dates from 1631. There are manufactures of soap and candles, as also several tanneries and breweries; these, however, produce only sufficient to meet the wants of the inhabitants. The commerce of the town has greatly declined since 1847, when the new road of Riazan was opened, leaving Zaraisk out of the way. Pop. '67, 5,165.

ZARAND, a co. in s.e. Hungary, bounded n.e. and s. by Transylvania; 501 sq.m.; pop. '70, 63,882. The surface is mountainous, and is drained by the White Körös, a branch of the Theiss. Mines of iron, lead, and silver are worked; cattle-raising is the chief industry. Capital, Körös-Bánya.

ZARATHUSTRA. See ZOROASTER, *ante*.

ZARSKOE-SELO, or SAINT SOPHIA, a t. of Russia in the government of St. Petersburg, and 17 m. s. from the city of St. Petersburg, with which it is connected by a railway. It has a college and a military school. The palace of Zarskoe-Selo is a summer residence of the emperor, founded by Peter the great in 1710, and the favorite abode of Catherine II. The church of St. Sophia is a miniature copy of the mosque of that name at Constantinople. Pop. in 1867, 6,741.

ZAUSCHNERIA, a flowering plant brought from California more than 30 years ago, and named after M. Zauschner, a Bohemian botanist. There is only one species known, and it has not been called by a common name. It is a perennial, belonging to the evening primrose family (q.v.). It has numerous stems from 1 to 2 ft. high, with ovate and ovate-lanceolate leaves, which, like the other parts of the plant, are soft and downy; flowers sessile in the axils of the upper leaves in the form of a raceme. They are about 2 in. in length, and resemble those of the fuchsia, belonging to the same family; long calyx four-lobed, corolla four-petaled, both of brilliant scarlet. The eight stamens and the long style project beyond the corolla. The seeds, which may generally be found in the seed stores, have each a tuft of silky hairs. It flourishes in New York and New England on dry soil if protected during the winter.

ZAVALLA, a co. of s. Texas, drained by the Nueces and Rio Leona; 1050 sq.m.; pop. '70, 133. The surface is nearly level, and the land mostly uncultivated. Timber and water are scarce. It is unorganized.

ZE'A (ancient *Ceos*), an island of the Grecian archipelago, one of the Cyclades, 13 m. e. of cape Colonna; 14 m. in length, and 8 in greatest breadth. It is somewhat egg-shaped. Its surface rises from the coast in terraces, culminating in the center in Mt. St. Elias, whose lat. is 37° 37' n., and long. 24° 21' east. The climate is healthy, and the soil fertile. The products are wine, fruit, barley, cotton, and silk. Attention is paid to the rearing of cattle and silkworms. Pop. 4,000. Pliny says that Zea was once united to Eubœa, but that four-fifths of it were carried away by the sea. Zea was the birthplace of the lyric poets Simonides and Bacchylides. The island once possessed four towns, but there is now only one, *Zea*, situated on the n.w. slope of the hill, about

3 m. from the coast, on the site of the ancient *Iulis*, of which the most important remain is a colossal lion, about 20 ft. in length, lying a short distance e. of the town. A few remains are also still to be found on the sites of the other three ancient towns. The harbor of Zea, Port St. Nicholas, about 3 m. from the town, admits the largest vessels, and is well frequented.

ZEAL. See MAIZE.

ZEALAND. See ZEELAND, *ante*.

ZEALOTS, often called Sicarii, were followers of Judas of Galilee. They are described by Josephus as a fourth Jewish sect, distinguished from the Pharisees chiefly by their love of liberty and contempt for death. During the last days of the Jewish state they were lawless robbers, and a terror to the land.

ZEBID, a t. of Arabia, district of Yemen, on the river Zebid, 15 m. from its mouth, 115 m. s.w. of Sanaa, and 60 n. of Mocha. The town is of great antiquity, on account of which and of the dark color of the bricks of which it is built it has a somewhat gloomy appearance. Zebid is strongly fortified, being surrounded by high walls, said to be a league in circuit, flanked with numerous towers. It possesses a large mosque, with an elegant octagonal tower. Zebid was formerly a place of much commercial importance, but it has declined into comparative insignificance, owing to the accumulation of sand in the mouth of the river. Pop. 7,000.

ZEBRA, a name sometimes given to all the striped *equidae*, all of which are natives of South Africa, and thus including the dauw (q.v.) and quagga (q.v.); but also in a more restricted use, designating a single species, *equus* or *asinus zebra*, a native of the mountainous districts of South Africa. In the whole group the characters more resemble those of the ass than of the horse; the tail is furnished with long hairs only toward the tip, and the hind legs are without warts; the neck is full and arched, the mane stands erect. The zebra is about 12 hands high at the shoulder. It is of a light and graceful form, with slender limbs and narrow hoofs; the head light, the ears rather long and open; the ground color white, or slightly tinged with yellow; the head, neck, body, and legs striped with black, the neck and body transversely, but not regularly; the head with bands in various directions, the legs with irregular cross stripes. The zebra lives in small herds, inhabiting the most secluded spots. Its senses of sight, smell, and hearing are very acute, and the least alarm is sufficient to make a whole herd scamper off, with pricked ears and whisking tails, to inaccessible retreats among the mountains. When attacked, however, and compelled to defend themselves, zebras do it vigorously, the herd forming in a compact body, with their heads toward the center, and their heels toward the enemy, repelling even the lion and leopard by their kicks. The zebra has been domesticated, and used as a beast of burden, but generally shows a vicious and untractable disposition. The flesh is eaten by the natives and hunters of South Africa. A hybrid has been produced between the zebra and the ass.

ZEBU', one of the Philippine islands (q.v.).

ZEBU, INDIAN OX, or BRAHMAN OX, a kind of ox, very nearly allied to the common ox, of which naturalists generally regard it as a mere variety, although some think it a distinct species (*bos Indicus*). The most conspicuous distinctive character is a large fatty hump on the back, above the shoulders. The legs are also rather more slender and delicate than in the European ox. The hump attains a very great size in animals plentifully supplied with food, and not compelled to work; in those which are ill fed or hard worked, it is comparatively small. It is alleged that intermixture takes place freely with the common ox, and that there is no difference of anatomical structure, but these statements require verification. Mr. Vasey found the number of caudal vertebrae in the Zebu to be only 18, while in the common ox it is 21. The period of gestation in the Zebu is also said to be 300 days, while in the common ox it is 270. The Zebu is diffused over India, China, the Asiatic islands, Madagascar, and the e. coast of Africa. There are many breeds, differing very much in size; the largest being larger than any oxen of Europe, while the smallest are not much larger than a large mastiff. The hump of the largest breeds is said to be sometimes 50 lbs. in weight. English residents in India esteem the hump as delicious for the table. There are hornless breeds; but most of the breeds have short horns. There is a breed with two fatty humps, one placed immediately behind the other, which is common in the vicinity of Surat. The voice of the Zebu resembles the grunting of the yak, almost as nearly as the lowing of the ox. The Zebu is used in India both as a beast of draught and of burden. It is yoked in the plow. It is occasionally used for riding. It can travel from 20 to 30 m. a day. It is very gentle and docile.

The Brahminy or sacred bulls of the Hindus, consecrated to Siva, are all of this kind of ox. They are caressed and pampered by the people, and to feed them is deemed a meritorious act of religion. The Brahminy bull may go where he pleases; it is not lawful to beat him, even if he be eating a valuable crop, or if he enter a shop and devour the articles exposed for sale. He soon learns to despise shouting, which is the ordinary expedient to drive him away, and makes himself at home everywhere.

ZEBULON, TRIBE OF, contained at the Exodus 57,400 men; and 40 years afterward 60,500, who were to enter Canaan. Its lot was in the north, having Asher on the w.,

Issachar on the s., and Naphtali on the north. Extending to the sea of Galilee, and to the Mediterranean, it fulfilled Jacob's prediction—"Zebulon shall dwell at the haven of the sea." It was also part of the region in which, according to Isaiah's prophecy, the gospel light first shone.

ZECCHI'NO. See **DUCAT**.

ZECHARIAH, called, in the book of prophecy which goes under his name, "the son of Berechiah, the son of Iddo," but in Ezra, "the son of Iddo," was born in Babylonia during the captivity, and accompanied the first band of exiles on their return to Palestine under Zerubbabel and Joshua. Very little is known of his personal history, but enough to assure us that he was a man of influence and a leader among his countrymen. He combined in himself the offices of priest and prophet. Ezra expressly ascribes to Haggai and him the merit of stirring up, by their prophetic inspiration, the patriotic enthusiasm of the Jews to complete the rebuilding of the temple. Later traditions, which are probably more or less in the line of historic fact, state that he assisted in providing for the service of the temple (various of the liturgical psalms being ascribed to him), and that he was a member of the great synagogue (q.v.).

The prophecies of Zechariah may be divided into three parts: the first (chapters i.-viii.) consists mainly of a series of visions relating to the building of the temple, the glory of the city, the removal of all abominations out of the land, etc., and winds up with a prediction that Jerusalem will become, as it were, a center of religious worship to all the world. The second (chapters ix.-xi.) threatens Damascus and Phenicia, and the cities of the Philistines with ruin; predicts that Judah will be greater than Javan (Greece), that Israel and Judah will be reunited—though almost immediately he symbolically shows the impossibility of this—and that both Assyria and Egypt will be humbled. The third part sets forth that dark times for Judah are drawing nigh, which shall be as an ordeal for the nation. After sore trial, it shall come forth thoroughly purged from iniquity, and then the Lord will appear in his glory on mount Olivet, fight victoriously against the hosts of heathendom, and compel all who are not destroyed by His wrath to worship Him at Jerusalem. A millennium of holiness will then begin: "In that day shall there be upon the bells of the horses, 'holiness unto the Lord' . . . yea, every pot in Jerusalem and in Judah shall be holiness unto the Lord of hosts" (xiv. 20, 21).

Numerous biblical critics, both in Germany and England, consider the first part only to be the work of Zechariah, and it cannot be denied that the internal evidence strongly favors this supposition. There is a unity, consistency, and sequency in the visionary predictions, and a harmony both of style and matter—the imagery bearing very distinctly the impress of those two master-spirits of the exile, Ezekiel and Daniel—that no candid critic can overlook, while the remaining chapters are totally unconnected in subject with what precede; contain no allusion to the post-exilic age, and speak of idols and false prophets in a way that would be utterly meaningless if applied to the times subsequent to the return from the captivity. The style also is quite different; is softer, richer, more poetical. The spirit of Ezekiel is exchanged for that of Jeremiah or the younger Isaiah. Whether these chapters are the work of one or two authors has also been elaborately discussed, the evidence being, on the whole, in favor of the latter view.

ZECH'STEIN (Ger. mine-stone), a deposit of calcareous rock which covers the Kupferschiefer, and which received this name because it must be cut through before reaching the mineral-bearing beds beneath. It is the equivalent in Thuringia of the fossiliferous limestones of Permian age of the n. of England.

ZEDEKIAH, originally **MATTANIAH**, the last king of Judah, son of the "good Josiah" by his wife Hamutal, succeeded his nephew Jehoiachin. The latter having rebelled against his master, Nebuchadnezzar, king of Babylon, was besieged in Jerusalem, and taken prisoner, after a brief reign of three months. Nebuchadnezzar bestowed the vacant throne on Zedekiah, doubtless in the expectation of securing a faithful liegeman. If so, he was mistaken. Zedekiah was a weak unwise ruler, probably incapable of political fidelity: in the phraseology of the Jewish historian, "he did that which was evil in the sight of the Lord." Forgetting his obligations to the Babylonish monarch, he lent a ready ear to the foolish braggadocio of the nobles and princes of Judah, and in spite of the earnest and reiterated remonstrances and warnings of Jeremiah, finally consummated his perfidy by forming an alliance with Egypt, the hereditary enemy of Assyria and Chaldea. Swift destruction overtook the traitor. A Babylonish army invaded and ravaged the country, besieged Jerusalem, and after inflicting a crushing defeat on an Egyptian force that was marching to the relief of the city, reduced the inhabitants to such horrible extremities that they could no longer hold out. Zedekiah, accompanied by his wives and children, fled in the darkness of night toward the Jordan, but was overtaken and made prisoner near Jericho. The monarch and his sons were sent to Riblah, at the n. end of the valley of Lebanon, where Nebuchadnezzar then abode. The conqueror, with customary Asiatic cruelty, ordered the sons to be slain before their father's face, and then deprived the wretched parent of his eyesight. Thus maimed, and bound with fetters of brass, he was conveyed to Babylon (588 B.C.), where

he probably died. The temple and city were destroyed, the inhabitants carried off into captivity, and the kingdom of David and Solomon ceased to have a place on the earth.

ZEDOARY (Arab. *Jedwar*), the name of certain species of *curcuma* (see **TURMERIC**), natives of the East Indies, the root-stocks (*rhizomes*) of which are aromatic, bitter, pungent, and tonic, and are used for similar purposes with ginger. They are more used in the east than in Europe, but are imported in small quantities, and sold under the name of zedoary. The **ROUND ZEDOARY** of the shops is the produce of *curcuma zedoaria*, a native both of India and China, having palmate root-stocks, straw-colored within. **LONG ZEDOARY** is produced by *C. zerumbet*, a native of various parts of the East Indies, having long palmate root-stocks, yellow within. Zedoary is a powerful sudorific.

ZEE LAND, a province of the Netherlands, consists of the islands Walcheren, North Beveland, South Beveland, Schouwen, Duiveland, Tholen, West Flanders, and East Flanders. It lies between 51° 20' and 51° 45' n. lat., and 3° 21' and 4° 15' 54" e. long., and has an area of 665 sq. miles. The boundaries are: South Holland on the n., the Easter Scheldt on the e., Belgium on the s., and the North sea on the west. Pop. (Jan. 1, '75), 184,215. In 1874, births, 7,593; deaths, 2,865; marriages, 1527. Nearly three-fourths are Protestants, having 138 churches; the remainder, except 670 Jews, with 4 synagogues, are Roman Catholics, who have 36 places of worship. The provincial capital is Middelburg. Other important towns are Flushing; Goes (pron. *Huse*), in South Beveland; and Zierikzee, in Schouwen. The greatest part of the soil, which is a rich clay, has been redeemed from the sea; and almost in the center of Walcheren, South Beveland, and Schouwen, there are seen still the high mounds of earth called "hills of refuge," which the early inhabitants formed as places of safety for themselves and cattle when a high tide burst over the newly acquired lands. The number of polders (q.v.), or drained districts, in the province amounts to about 400. It is almost entirely arable, and produces the finest crops of wheat, barley, oats, rye, peas, beans, colza, beet, flax, hemp, canary-seed, mangolds, etc. Potatoes are extensively planted; and madder for the manufacture of dyeing material forms a valuable agricultural product. Horses, horned cattle, sheep, swine, and goats are the stock. In many districts of Zeeland extensive orchards beautify the farms.

The neighboring seas abound with fish, and in Schouwen many eggs are collected, myriads of water-fowls resorting thither to form their nests. The principal industries, apart from agriculture, are the preparing of madder for the market, weaving calicoes, rope-spinning, ship-building, beer-brewing, soap-boiling, making vinegar, salt, starch, tobacco, tile and brick, tanning leather, grinding corn, sawing wood, etc. The people of Zeeland are kind and hospitable, and in the country parishes are much attached to their fairs, meetings for merry-making, and other old customs, which might with advantage be given up. Few marriages take place among the agricultural portion of the population till absolutely necessary, but a case of desertion rarely occurs, as it would utterly disgrace the young man who did so.

On Oct. 15, 1866, a fine ship-canal through the island of South Beveland was opened, and takes the place of the Easter Scheldt. A railway from Flushing, through Walcheren and South Beveland, communicates with the main Belgian lines at Roosendaal, and by Breda leads to Rotterdam, Amsterdam, or Germany.

ZEISBERGER, DAVID, 1721-1808; b. Zoetenthal, Moravia; educated by the Moravians of Saxony, and lived at their settlement, Nerrendyk, Holland; went thence to England; by the aid of gen. Oglethorpe, joined his parents, who had emigrated to Georgia several years before; went n. and was one of the founders of Bethlehem, Penn., 1740; became a missionary, laboring among the Delawares at Shamokin, and the Iroquois at Onondaga, till the breaking out of the war, 1754; the war having closed he led the Christian Indians, who had fled to Philadelphia, to Wyalusing, on the Susquehanna; established a church among the Monseys on the Alleghany, 1767; going further into the wilderness in 1772 he laid out the town Schoenbrunn, on the Tuscarawas, Ohio, and was afterward joined by all the Moravian Indians of Pennsylvania. The settlements were destroyed in 1781 by a band of Wyandotte warriors, and the Christian Indians removed to Sandusky, many of whom were treacherously murdered by some white settlers. The converts being now dispersed, Zeisberger, with a small remnant, went to what is now Michigan, 1782; went in 1786 to lake Erie and founded New Salem; emigrated to Canada, 1791, and founded Fairfield; returned with some of his converts to Ohio, congress having granted them land in 1798, and built a new station, calling it Goshen. There he preached till the close of his life. He published several works in the Indian languages.

ZEITHUN, a t. and district in the highlands of Cilicia, lying in 37° to 38° n. lat. and 34° to 35° e. long., inhabited by a community of Armenian Christians, virtually independent of the Turkish government, and forming in fact an Asiatic republic. Zeithun lies in the upper basin of the Jyhun or Pyramus, where that river crosses the Taurus mountains in descending from the table-land of Asia Minor to the low plain of Cilicia, which surrounds the n.e. corner of the Mediterranean sea. It is surrounded on all sides by inaccessible crags, except on the e., where it is bounded by the deep channel of the Pyramus. The hills are covered with magnificent pines, plane trees, and evergreen oaks. Springs and brooks, never dried up during the summer, irrigate the meadows in all directions; but the soil, although abounding in patches of great fertility, does not produce

grain in sufficient quantity to supply the wants of the inhabitants. The mulberry trees are, however, numerous in the orchards, and give constant occupation to the women in feeding silk-worms. The men are chiefly engaged in smelting and manufacturing the iron supplied by the mountains into plowshares, horse-shoes, nails, etc., which they exchange for corn and other articles at Marash and Kaisariyeh. The language of Zeithun is a rude dialect of Armenian, in which the only literature consists of popular songs not committed to writing. Education is much neglected among children, who, except when intended for the priesthood, are not sent to school after the age of 10 or 12. The inhabitants, like the kindred race in Armenia, are free from Asiatic vices. They resemble Europeans in their respect for women. Crime is not frequent. No prisons exist, and it is asserted that murder has never been committed in the country for the sake of gain. There may be exaggeration in these statements, but the Zeithumlus are certainly open-hearted mountaineers. They have, however, shown the greatest jealousy of foreigners; and until 1854, when their country was visited by M. Léon Paul, a French Protestant clergyman, we only knew of them from the statements of Armenian priests, and articles in the Armenian newspapers of Constantinople. Even now, our information about them is rather scanty. The government seems to be patriarchal, vested in elders of the people, with some prerogatives in the priesthood. When a grievance is felt, complaint is made to the priests, who meet in council, and refer the complaint to the elders assembled as a senate: they decide on the course to be taken. All offices are conferred by popular election, the executive power being placed in the hands of four princes. There are 20 villages in the district, and the chief town, Zeithun, is said to contain 20,000 inhabitants. The Zeithumlus can muster an army of from 7,000 to 8,000 men to defend the mountains against the Turkish pashas; and they are in alliance with a neighboring Turcoman chief, also independent of the Turks, who brings 10,000 men into the field. Zeithun is a relic of the Armenian kingdom of Cilicia, founded in the 11th and destroyed in the 14th c. Since that period, the native populations have been gradually assimilating to the Turks, a change much favored by the extreme facility with which the Turkish language is acquired. It was not till after the Crimean war that the massacres in the east called special attention to the existence of Zeithun and other Christian communities in the east, which had some claim to European sympathy. An attempt by the Turks to settle Circassians near Zeithun, gave Aziz Pasha of Marash an opportunity of attacking the Christians, and the atrocities committed remind one of the worst excesses of Cawnpore. The inhabitants defended themselves, however, with the greatest gallantry, twice defeating in the field large Turkish forces; and the struggle was at length terminated by the interference of the French and English governments at Constantinople, and the recall of the pasha. Unfortunately the Turks were allowed to suppress the Armenian newspaper which acquainted the European public with what is taking place at Zeithun, and we now hear little about it. But the Zeithumlus have from time to time to defend themselves against Turkish encroachment.

ZEITZ, a walled t. of Prussian Saxony, in the government of Merseburg, 23 m. s.w. of Leipsic, lies in a pleasant and fruitful district, on a steep slope, on the right bank of the White Elster, over which there is a stone bridge. The town is very old, and has some good old public buildings; a cathedral and four other churches; a good library, containing 12,000 vols. besides MSS.; asylums for orphans and lunatics, an old and new castle, etc. There are manufactures of cotton earthenware, leather, calicos, hosiery, gloves, etc.; several print-fields, breweries, and distilleries. In the neighborhood are extensive mineral-oil works. Pop. '75, 16,486. It is a station on the Thuringian railway.

ZELA'YA, a t. of Mexico, in the state of Guanajuato, about 120 m. n.e. of the town of Mexico, with a fine cathedral. There are manufactures of cotton and saddlery. Pop. 14,000.

ZELLER, EDUARD, a distinguished German theologian and historian of philosophy, was b. in Württemberg in 1814, and studied theology at Tübingen and Berlin. He was one of the ablest and most pronounced of Baur's disciples (see BAUR), and his call to a theological chair at Bern in 1847 was the occasion of fierce controversy and opposition from the orthodox. In 1849 he was removed to Marburg; in 1862 became professor of philosophy at Heidelberg, and in 1872 at Berlin. Latterly he has almost solely confined himself to philosophical studies. His principal work is *Die Philosophie der Griechen* (3 vols., 1844-52; 4th ed. 1876; Eng. trans. 1875). Amongst his other works are the notable book on the Acts of the Apostles (1854), *Das Theologische System Zwingli's* (1853), his essays (*Vorträge und Abhandlungen*, 2d ed. 1875), and his edition, with biography, of the works of his friend, D. F. Strauss (1876-78).

ZEMINDAR, the name given to the governors of districts or large towns in India, under the mogul rule. Many of the zemindars occupied in India a position almost similar to the dukes and counts of western Europe in the middle ages; they received from their superiors, the nabobs or provincial governors, fiefs of more or less extent, for which they paid a certain due annually, being then exempted from all other imposts whatsoever. The dues paid by the zemindars were, of course, exacted, with additions, from the ryots or cultivators, and constituted a large part of the imperial revenue. Under the British government the same system of tax-collection is continued in Beugal,

the zemindars in that presidency being looked upon as the hereditary lords or proprietors of their respective districts. The zemindars of the Coromandel district were formerly called *polyghars*. Under the zemindars were the *havildars*, or heads of villages, whose duty it was to collect their share of the tax imposed by the zemindar, and as, like their chief, they took care to collect an additional proportion for themselves, the most atrocious oppression was commonly practiced; the "nabob" pillaging the "zemindars," the "zemindar" in turn plundering his "havildars," while the "havildar" more than reimbursed himself at the expense of the Hindu villagers.

ZEMPLÉN, or ZEMPLIN, a co. in n. Hungary; bounded on the s. by the Theiss, and on the s.w. by the Hernád; about 2,400 sq.m.; pop. '70, 292,771. The surface is mountainous or hilly. The soil in the s. is fertile. The celebrated Tokay wine is grown in the Hegyalja, in the s.w. Capital, Satoralja-Ujhely.

ZENANA, a word of Persian origin, signifying that part of the domain of a native gentleman of India occupied by the women of his family. In Bengal, where is the typical zenana, the dwelling consists of two houses built each round its own court. The one on the street, where dwell the father, sons, grandsons, and great-grandsons, has large, lofty, well-furnished rooms which open to the outer air. In the rear building the first floor is for cow-sheds, storage and cook rooms; above are cells, 10 to 12 ft. square, each having one door and one small grated window opening upon piazzas, which, in one, two, or three tiers, surround the inner court. Faint breath of heaven it is which, mingled with the odors from below, reaches these rooms. The only furniture of these dismal cells, even when the appointments of the gentlemen's rooms are sumptuous, are a bedstead with a strip of mat upon it, a chest, a brass cup, and sometimes another small mat to spread on the brick floor. When a son marries he brings his little bride to his father's house, and thus sometimes 50 women, each being an only wife to some one of the male occupants of the outer house, are domiciled in the zenana. Polygamy is rare, though permitted. To each wife one of the cells above mentioned is assigned in which to rear her children, but at the time of a birth she is deprived of the poor comfort it might afford. She is removed to a cow-shed below, where, on a straw mat spread on the floor of beaten earth, with only a mat-screen between her and the animals, she must remain for 28 days, without doctor or nurse, or any one to speak to her but a low-caste coolie woman. This treatment begins usually when the little mother is not yet 11 years old. The zenana lady would rather die than be seen by a man other than her own husband; therefore a husband cannot enter the zenana to visit his own wife until all the other women have hidden within their respective cells.

ZEND,* the language in which are composed the ancient sacred books of Zoroaster, first became known through Anquetil-Duperron (q.v.). Many scholars of eminence, like William Jones, Meiner, Henning, W. Erskine, and others, warmly contested the age of these writings. They held that the idiom in which they were couched had never been spoken in any part of Persia, but was a Sanskrit dialect which had been introduced from India for sacred use. The so-called Zoroastrian writings, they said, dated from the time of Ardeschir-Babegan, the first Sassanian, in 230 B.C., or had at least been rewritten and redacted at that time. The first who endeavored to lay the foundations for a real grammatical knowledge of Zend was Rask, the Dane, who in 1816 undertook a journey to India and Persia, in order to make researches into the origin and nature of this language on the spot. Although he did not live to make known all the results of his investigations, he yet proved irrefutably that the sacred language of the Parsees was closely connected with that of the Brahmins; or, in other words, that Zend was akin to Sanskrit, and that, like the latter, it had retained some of the earliest formations of the Aryan dialects. Eugène Burnouf followed in his steps. He was indeed the real founder of Zend studies in modern Europe. By the aid of his knowledge of Sanskrit and comparative grammar, he proceeded to decipher, for the first time, the sacred writings of Zoroaster in the original; while Anquetil-Duperron, who first made the *Zend-Avesta* known in a European garb, composed his translation only from a modern Persian translation. Both he and Bopp contended for the independent and ancient existence of Zend, holding that Sanskrit, being a new language which came from the north, was more likely to be derived from the Zend than the latter from Sanskrit. The opinion of Haug, the latest, and by far the most successful investigator of Zend language and literature, is, that Zend is almost identical with the most primitive—the Vedic—form of Sanskrit. We shall give in the following sketch the results of his studies, which unfortunately have as yet appeared only in the preparatory shape of essays.

The Zend idiom, in its widest sense, embraces two so-called "Bactrian" dialects, which, together with the "West Iranian" languages, i.e., those of ancient Media and Persia, form the stock of Iranian tongues. These tongues were once spoken in what

* Much uncertainty prevails as to the real meaning of the word Zend. The name *Zend-Avesta* (q.v.) is, by the native scholars, understood to mean commentary (*pehlvi*) and text, an opinion supported by the most eminent Zend scholar of our day, Dr. Haug. The opinion of Max Müller to the effect that Zend is identical with the Sanskrit *chandas*—a name given to the Vedic hymns—and *Avesta* = *avasthāna*, a word which, if it occurred in Sanskrit, would mean settled text, requires further confirmation.

the *Zend-Avesta* calls the "Aryan countries" (*Airyáo dānhāvō*). The former, the "East Iranian" or "Bactrian" branch, has survived, in its two dialects, in the scanty fragments of the Parsee scriptures only. The more ancient of them is called the "Gātha dialect" because the largest and most important pieces preserved in this peculiar idiom are the Gāthas, or songs; the younger or "ancient Bactrian," also "classical Zend language," is the one in which the greater part of the *Zend-Avesta* (q.v.) itself is written. Both dialects seem to have died out in the 3d c. B.C., leaving no linguistic progeny. The general character of Zend, in its widest sense, is that of a highly developed idiom, inasmuch as it is as rich in inflections (there are no less than three numbers and 8 cases) as is the Vedic Sanskrit, and is richer even than the Latin in the variety of forms inherent in its verbs and nouns. There are numbers of compound words in it; and the whole syntax bears the stamp of an advanced stage of linguistic progress. A genuine sister of Sanskrit, Greek, Latin, and Gothic, it is yet only known to us, much as is the Hebrew in its declining phase. The forms are no longer accurately kept distinct, and a return to the originally uninflected state, is noticeable, principally in the verbs. It may be that the Bactrian grammar had never been properly fixed by rules, and that, in the absence of that tender care which the Brahmans took of the preservation of the Sanskrit texts and idiom, many corruptions and abbreviations gradually crept from the colloquial into the classical language of Zend, and were thus perpetuated in the surviving remnants. As soon as the language of the Zoroastrian books died out from daily use, these books were mechanically copied, time after time; and any number of blunders, unchecked by an understanding of the structure or details of the language, crept in unheeded. The oldest copies are the best, comparatively speaking: the more modern the copy, the oftener the terminations are found as separate words; vowels are inserted according to the faulty pronunciation of the writer, and a number of other faults, of omission, or commission, are patent at first sight, solely due to carelessness and ignorance. Before indicating the general character of Zend, we shall briefly observe that its two dialects differ both phonetically and grammatically; and the phonetical differences are so great, that at first sight, it would almost appear as if they were caused by different localities rather than ages, but, on closer inspection, it is found that the singing of the Gāthas, whereby certain vowels were lengthened out, has caused many of these striking peculiarities. Grammatically, the Gātha dialect shows many deviations from Zend, traceable to the more primitive state of the Bactrian language which it represents. But the differences between the two are not so great as between the Vedic and the classical Sanskrit, and between the Greek of Homer and the Attic dialect. At most, the Gātha may be reckoned to be 100 or 200 years older than that classical Zend which formed the classical language of the ancient Iranian empire, as depicted in the earlier parts of the *Shāh Nāmah*.

There are 2 simple vowels and about 14 diphthongs in Zend, for each of which there are special characters. Of vowels peculiar to this idiom may be mentioned the *ā* (long, with a nasal sound), used chiefly in the genitive plural termination; further the *ē*, which, in the Gātha dialect, often replaces the final *ō* of the usual Zend, and which, by the frequency with which writers confound it with *i*, would also prove itself closely allied to that sound. There is, further, an initial *a* to be observed, which probably crept into the Zend texts when they were transcribed into their present characters, which, no doubt, are borrowed from the Syriac. This *a* corresponds to the aleph prostheticum of the Semitic idioms. Again, the short vowels are always lengthened at the end of a word in the Gātha dialect: owing, most probably, to the circumstance that the Gātha literature—the most sacred hymns—were sung, and the singer's voice resting upon the final vowel, whether long or short, had the effect of lengthening it even in the MSS., written mostly from memory. Of consonants, there are 6 gutturals, 2 palatals, 4 dentals, 3 labials, 4 semivowels, 5 sibilants, 5 nasals. The roots are mostly monosyllabic, consisting occasionally of one vowel only, or being a combination of a vowel with a simple or double consonant, or of two consonants with a vowel between them: e.g., *i*, to go; *dā*, to give; *gā*, to go; *mere*, to die, *as*, to be, etc. Additional sounds added to the simple roots, enlarge and otherwise change the meaning of a word—*dā*, to make, becomes, by the addition of *th*, *dath*, to place; from *mere*, to die, is derived *merech*, to kill. Three chief modifications are to be noticed in the verbal roots, irrespective of tense and mood—viz., the "causal form," expressing the idea of "to make," "to get made," which is formed by lengthening the vowel of the root, and adding the syllable *aya*, as in Sanskrit. Next stands the desiderative form, expressing the wish of obtaining anything, which is formed by the reduplication of the first syllable and the addition of *s* to the crude form before the terminations. The last or intensive form, used to render the verb more emphatic, was originally produced by a simple reduplication of the root and the termination; afterward, only the vowel of the first part was lengthened, and the consonants following were omitted. Three voices—the active, middle or reflective (Lat. deponent), and the passive—obtain in Zend, as in Greek and Sanskrit; and there are four chief moods, which may be used in all these three voices—the indicative, subjunctive, potential, and imperative. The subjunctive is of a double nature, the one expressing the "might, would, or should," the other the "may"—a feature lost in classical Sanskrit, and only to be met with in the ancient language of the Vedas. The potential, too, is of two kinds, corresponding to the Sanskrit "potential" and "precativ." There are as many tenses in Zend as there are in Sanskrit, though fewer than in

Greek, which is, in this respect, the richest of the Aryan stock. There may be distinguished one formation for the present, four for the past, and two for the future.

The general scheme of the (active) present and imperfect is as follows:

PRESENT.		IMPERFECT.	
<i>Active Voice.</i>		<i>Active Voice.</i>	
Sing.	1. mi. 2. hi. 3. ti.	Sing.	1. m. 2. s, ô. 3. t.
Dual	1. vahi. 2. (lost). 3. tô, thô.	Dual	1. âva. 2. (lost). 3. tem.
Plur.	1. mahi. 2. tha, dûm. 3. fti.	Plur.	1. ma. 2. ta. 3. en, añ.

The division of the "crude" forms into ten classes, in use with the grammarians of Sanskrit, is also fully applicable to the Zend. Additions and reduplication make up the distinguishing features. The past tenses are likewise formed, as in the sister tongues, by augmentation, reduplication, or composition. Apart from those forms which are identical with those employed in Sanskrit, Greek and Lithuanian, Latin, and the ancient Teutonic languages, we find the use of two kinds of subjunctives. Equal richness of forms is found in the participle and the infinitive, whilst there are fewer gerundial forms than in Sanskrit. Nouns are formed out of roots by the addition of suffixes, which generally correspond to those of the cognate languages. There are three genders in Zend—masculine, feminine, and neuter. The comparative and superlative are formed very nearly as in Sanskrit and Greek. The number of compound nouns in Zend is somewhat less than in the Sanskrit and Greek, on account of its standing nearer the more simple Vedic idiom. There are three numbers and eight cases of inflection for singular and plural of nouns; while there are no less than five cases in the dual, no other Aryan language having retained more than three. The terminations of the cases (in words ending with a consonant) are somewhat according to the following scheme:

SING.		DUAL.	PLURAL.
Nom.	s.	{ a.	ô (aç).
Accus.	em.	{ a.	ô, âs,
Instr.	a.	{ bya.	bis.
Dat.	ê.	{ bya.	byô (byaç).
Ablat.	at.	{ âo.	byô.
Gen.	ô (aç).	{ âo.	am,
Locat.	i.	yô.	aêshu, aêshva, hva.
Voc.	= Nom.	“	

There are only pronouns of the first and second persons to be found in Zend, the third being made up by a demonstrative pronoun. There are some older forms to be found in the Gâtha dialect only. Most of the pronouns resemble closely the Sanskrit forms. The relative is sometimes used as a demonstrative. The numerals from one to ten are: aêva, dva (va, dugê, ayê), thri, chathware, poñcha (meñda), khshvas (khshvîdem), hrupta, asta, nava, daça. The following numbers are formed by the addition of the single cardinal numbers to the ten or daça: 20 = viçaiti, 100 = çatem, 200 = dbye çaitê, 1000 = hazanra, 10,000 = baêvare, 100,000 = ahôkhsta. The ordinals are: païorya, first; bitya, second; thritya, third; khtûiryah, fourth; pukhdha, fifth, etc. "Multiplication numerals" are formed by addition of *keret* and *vat*—e.g., hakeret, once; bizhvat, twice; thrizhvut, thrice; etc. Particles and prepositions are often identical with those of Sanskrit. The latter may be separated from the verb, if forming part of it, as in the case in the Vedic and Homeric languages, but not in classic Sanskrit or Greek.

We have started with the now fully proved assertion that Zend is closely allied to Sanskrit, more especially to the ancient Vedic dialect. To the latter it bears about the same affinity which the different Greek dialects (Æolic; Doric, Ionic, Attic) bear to one another. The ancient Brahmins and the Parsees are but two tribes of the nation which is called Aryas both in the *Veda* and *Zend-Avesta*, the former somewhat to be compared to the Ionians, the latter to the Dorians. But in comparing Zend with Sanskrit it is noticeable that it resembles more the primitive Vedic than the classical Sanskrit. In verbal forms, chiefly moods and tenses, the classical Sanskrit is much poorer than it is in its primitive Vedic phase, having lost various forms of the subjunctive mood, most tenses of all other moods, except indicative, the manifold forms expressing the infinitive mood, while all these are found completely preserved in the *Vedas*, *Zend-Avesta*, and Homeric Greek. From these and many other signs it would indeed follow as if the classical Sanskrit had been formed long after the separation of the Iranians from the Hindoos. The differences between the Vedic, Sanskrit, and Zend are very minute in grammar, but important both phonetically and lexicographically, like the difference between German and Dutch. But the philologist can easily transform, by slight phonetic changes, the Zend word into the Sanskrit one. As a striking proof of the original iden-

tity of grammatical forms between the two, the circumstance may be cited of their both exhibiting certain identical irregularities.

For *Zend literature* we may refer both to our articles on PERSIAN LANGUAGE AND LITERATURE and to ZEND-AVESTA. We confine ourselves here to a brief mention of the principal items. At the head stand the five Gâthas, which may safely be ascribed to Zoroaster and his disciples themselves. There is no doubt that what now survives is but a scanty fragment of what once existed of this literature. Probably they but represent a selection of verses considered most efficacious for putting down evil influences, and for increasing the welfare of the Zarathustrians. The Gâthas, as they now stand, may be compared to the Sâmvêda, which contains selections from the Rîgvêda, used at the Soma sacrifices. Next in order stand the Yasna, or seven chapters, containing songs and prayers, which dates from a much later period; and here again the first portion, or "Younger Yasna," is of still later date; and on the same line stands the Visparad, the collection of prayers called "All heads," in 23 chapters. The Vendidad, on the other hand, represents conversations held by Zoroaster with Aburamazda on religious topics, and is most likely the work of the high-priests of the Iranian community of later periods. The Yashts, or songs and conversations, are the latest. The age of the different works mentioned is fixed by Haug in the following manner: The Gâthas about 900 or 1200 B.C.; the larger portion of the Vendidad at about 900 or 1000 B.C.; the younger Yasna, about 700-800 B.C.; the latest part of the Vendidad (the Pazend) being written as late as 500 B.C., when the collection of the different parts also seems to have taken place. This computation would give the Zend, or rather the famed Parsee literature, a range of about 800 years, or from 1200 to 400 B.C. Cf. Haug's *Essays on the Religion of the Parsees* (Bombay, 1862).—See PERSIAN LANGUAGE AND LITERATURE, ZEND-AVESTA, ZOROASTER.

ZEND-AVESTA, or rather (as the Pehlvi books have it), AVESTA-ZEND, is the name of the sacred writings of the Parsees (q.v.). The word Avesta (*avasthûi*) means text, scripture; Zend, or Zand, translation or commentary and paraphrase. According to the last researches in this province, it would seem as if only a small portion of the entire collection now extant were formed by Avesta, or text, the rest being made up of Zend, or commentary, without text. The term Zend has indeed changed its meaning repeatedly. From an authoritative interpretation, emanating from the highest source, in time becoming embodied in the text itself, it came to denote, later, a translation into the native idiom of Persia (the Pehlvi), made by the Zoroastrian priests during the Sassanian period. There is further a special "Zend doctrine" to be noticed, which differs considerably from that contained in the Avesta. A still further explanation of that Zend doctrine is the Pâzend, a word often to be met with in connection with Avesta and Zend. Of this we shall further have occasion to speak.

But before proceeding with an elucidation of the contents and purport of these Zend writings, we must devote a brief space to a sketch of their history, or rather of the different phases the acquaintance with them on the part of the west has undergone. The doctrine of the "Magi," as the ancient world was wont to call the priests of Zoroastrianism, as well as those of India, Persia, and Babylonia, is first alluded to in Jeremiah, where the chief of the Magi is mentioned among Nebuchadnezzar's retinue. In the New Testament (Matt. ii. 1), Magi come to worship Jesus at Bethlehem. The earliest account among Greek writers is furnished by Herodotus, who, on the whole, seems well enough informed for his time. Besides him, we hear of accounts by Ctesias, the Greek physician of Artaxerxes II., by Deinon, Theopompus, and Hermippos. But only fragments from their writings have survived, embedded chiefly in Plutarch and Diogenes Laertius. Pliny, Strabo, Pausanias, Dion Chrysostomus further enlarged the stores of knowledge, which, more or less trustworthy, may be gathered from independent sources. Omitting later Greek writers, such as Damascius, Theodorus of Mopsuestia, etc., we turn to Armenian writers of the 5th Christian century. Among them we find Ezuk and Elizæus, from whose records we may gather that the Zoroastrians at their time were split into two parties, the one called Mog, the other Zendik; the former inhabiting chiefly the western parts—Media and Persia principally acknowledging the Avesta; while the latter, living principally in the e. (in Bactria), followed the traditional explanations, or Zend proper. To the Arabic writer Masudi (950 A.D.) we owe a comparatively correct account of the sacred book; while Sharastani (1153 A.D.) is perhaps the first among his countrymen who ranks the Zoroastrians with those other professors of Semitic creeds, the Mohammedans, Jews, and Christians, and not among the idolaters and pagans. In this time they were already split into many sects, those who believed in the transmigration of souls, like the Brahmans, Buddhists, etc. As a successfully carried out piece of deception, it is to be noticed that Mohammedan writers, for the most part, seem to countenance the fable palmed upon them during the times of persecution by the Magi, that Zoroaster was identical with Abraham—in which there is not one atom of truth. The nations of modern Europe came into contact with the adherents of Zoroastrianism in the western parts of India, and in the 17th c. some MSS. of their sacred books were brought to England. But no one was able to read them; and Hyde himself, the celebrated Oxford scholar, was unable to make any use of them when, in 1700, he wrote his learned work on the Persian religion. A sort of romantic freak first put Europe into the possession of the key to this book, the language of which had been lost

for above a thousand years. A young Frenchman, Anquetil-Duperron, happened to see a few pages that had been copied from a Zend MS. in the Bodleian library, and he instantly resolved to take himself to India in quest of the original Zend writings. To achieve his purpose, he, being without means, had to go as a sailor on board a ship belonging to the French India company, bound for Bombay, in 1754. The French government however, stepped in shortly afterward, and furnished him both with money to purchase MSS and with a pension, that he might pursue his studies with greater ease. He prevailed upon several of the dusters, or learned priests, to introduce him into the mysteries of the holy language and rites, and further to sell him some of the most valuable works couched in it. When he considered himself sufficiently competent in Pehlvi and Zend, he commenced a translation of the whole Zend-Avesta in French, in 1759. Two years later he returned to Europe; and having convinced himself by a comparison with the Oxford MSS., that those he had acquired of the sacred writings were genuine, he went to Paris, where he deposited his treasures—180 MSS. in different oriental languages; and published, ten years after leaving India, 1771, the first European translation of the Zend-Avesta, to which was added a great deal of supplementary matter, bearing more or less on the subject. The work created a profound sensation throughout Europe; but, after a while voices began to be heard by no means so favorable as had been anticipated by the bold and persevering discoverer. Apart from the objections raised against the new book by Immanuel Kant the philosopher, on the score of its not containing any traces of philosophy, a much graver question was ventilated in England—viz., that of its authenticity. It was not that Anquetil was charged with forgery, but the priests, it was said, had found in him a ready dupe. It was principally sir William Jones, who, in a trenchant letter addressed to Anquetil-Duperron (in French, being, as sir William Jones said, the only language which Anquetil understood—a *little*), tried to prove the utter untrustworthiness of the whole work. He was aided therein by Richardson, the Persian lexicographer, who, from four reasons—neither of which, however, is valid—came to the conclusion that the book was a spurious fabrication. While in France there was but one opinion on the subject—viz., that English scholars were trying to run down the work out of sheer spite and jealousy—the opinions of Germany were rather divided. Some, like Meiners and Tychsen, fully acceded to the proofs arrayed against it; but there arose another renowned German scholar, Klenker, who, in token of his complete and unreserved trust in the genuineness, set about translating Anquetil's French translation into German, adding several appendices, etc., and principally pointing out the now generally-recognized agreement between the more important heads of the doctrines as contained in the book and in the classical writers. Thus matters stood for a long while. In Germany, Anquetil's translation, as rendered by Klenker, became the standard work even for theologians; in England, none any longer thought about it, it having been fully agreed upon by the highest authorities that it was nothing but a clumsy forgery. More than 50 years had elapsed from the appearance of that work, when a Dane, Rask, undertook to look into the matter. Having himself acquired many Zend and Pehlvi MSS. in Bombay for the Copenhagen library, he wrote (1826) a pamphlet, in which he first showed not only the close affinity between the language of the Zend-Avesta and Sanskrit—which had been pointed out by Erskine and others before—and further proved it to be, not a corruption of Sanskrit, but a distinct language. He also proved that modern Persian was derived from Zend, as Italian from Latin—a step which at once removed all doubts about the genuineness of the work, and confirming, however, how, to a certain extent, Anquetil, to whom all praise was due for having been the first pioneer, had, through the absence of the requisite philological aids, been occasionally misled in his version in the most woful manner. The learned duster himself—with whom Anquetil communicated only in Persian—though well acquainted with the Parsee traditions, and favoring mostly the general sense of the passages; yet possessed no grammatical knowledge whatsoever of the language he pretended to teach. Rask had pointed out the way; Eugène Burnouf followed it. He indeed may be called the founder of Zend philology. For more than 20 years this eminent scholar devoted all his energies to elucidating, commenting, and discussing this language and the sacred writings couched in it, and in publishing texts and translations. In Germany, Olshausen, Bopp, Müller, Brockhaus, Spiegel, Haug; in Copenhagen, Westergaard, have been busy ever since in editing and translating either portions of or the entire Zend-Avesta; and though the rediscovery of the language is by no means an accomplished task, yet, thanks to their indefatigable labors in this field, we are certain that, sooner or later, we shall be in the full possession of all the facts connected with the language and its sacred depository, the Zend-Avesta.

We now address ourselves to the book itself. We know, both from the Parsee traditions and from independent classical witnesses, that the Zend-Avesta was originally of very vast extent, incomparably vaster than the work that now exists under that name. Pliny speaks of 2,000,000 verses composed by Zoroaster; and an Arabic writer, Attavari, mentions the number of 12,000 cowskins (parchments), of which Zoroaster's writings consisted. No doubt these are but round eastern figures; but it may safely be assumed that the sacred literature in question must once have been of very great extent. The Parsees ascribe its loss to Alexander the great, but it is more likely that their traditions in that respect refer to the Mohammedan conquests. Yet even then, the greater part of

the sacred literature was already lost, and the date of Alexander may in so far be correct, that the Greek ideas that followed in his wake turned the believing minds from the primitive faith, and carried a gradual neglect and loss of the documents in which it was contained, with it. For 500 years—from the Macedonian conquest, 335 B.C., to the accession of the Sassanians to the throne of Iran, 235 A.D.—the Zoroastrian religion was not supported by any kings, and decayed in consequence. But when the Sassanians assumed the rule, their principal endeavors were directed to the revival of the ancient faith; and their unceasing researches after the ancient fragments of the Zoroastrian gospel have resulted in the small collection which we now possess. Yet the names and the summaries at least of all or most of the lost portions have survived. The whole scripture is reported to have consisted once of 21 nosks, or parts, each containing Avesta and Zend—that is, text and commentary on it. The number 21 was to correspond to the 21 words of which the most sacred prayer of the Zoroastrians (the Honovar) was composed. The first of these sections comprised 33 chapters, containing the praise and worship of angels; the second (22 chapters) contained prayers and instructions to men about good actions; the third (23 chapters), an explanation of religious duties and commandments, and the way to avoid hell and acquire paradise; the fourth (22 chapters), knowledge of both this and the future worlds and their inhabitants, revelations concerning heaven, earth, water, trees, fire, men and beasts, the resurrection of the dead, and the passing of the bridge Chinvat; the sixth (35 chapters) treated of astronomy, geography, astrology; the seventh (22 chapters), of food, lawful and forbidden; the eighth (50 chapters, of which, at the time of Alexander, only 13 were extant) treated of the different heads or chiefs in the creation; and the ninth (in 60 chapters) contained a code of laws for kings, governors, etc.—also a portion about the sin of lying; the tenth (60 chapters) treated of metaphysics, natural philosophy, divinity, etc.; the eleventh (60 chapters) treated of the reign of king Gustasp, and his conversion to the religion, and its propagation by him through the world, etc. Of all the 21 nosks, however, one only, the twentieth (in 22 chapters), called the Vendidad, has survived complete. This treats of the removal of uncleanness of every description, from which great evils arise in the world. Some fragments of the other parts only, chiefly the fourth and eleventh, have survived. But there are now in sacred use among the Parsees other books either not included in the foregoing list, or but imperfectly indicated in it. Of the former are the Yazna (Izehne) and the Visparad (Visparatu). To the latter class belong 24 sections called Yashts, and some small prayers of different kinds, such as Afrigân, Nijâyish, Gâhs, and Sirozah, or Calendar. Before speaking of these books, we shall say something about their authorship, for which point we further refer to Zoroaster (q.v.). By the unanimous consent of both classical writers and the Persians, the whole bulk of the sacred literature is ascribed to Zoroaster himself. They were supposed to be the substance, or, as was held afterward, the very words of divine revelations from God to the prophet, in the form of conversations. These revelations do not at first appear to have been committed to writing, but to have been orally preserved by his disciples and adherents, and to have been handed down by them to posterity. Surprising as this may seem at the sight of what has remained as the infinitely larger bulk even of what has perished, it must be borne in mind that, e.g., the Vedas, the Talmud, and the Sunnah have been preserved equally faithfully in the mouths of many generations. The name Zoroaster or Zarathustra—in as far as to him is ascribed the authorship of the whole of the sacred writings—is to be taken collectively rather than individually, i.e., as indicating a school of successors and high-priests of the founder, who is designated Zarathustra *Spitama*; while the chief divines who took his place in after-times were only called Zarathustra. That their decisions and sayings were afterward “hedged in” with the same reverence as those of the founder himself, need not be argued at length. All that can really be held to emanate from the prophet himself are the five *Gâthas*, which form part of the *Yazna* (Sansk. *yajna*, sacrifice). This *Yazna* consists principally of prayers to be recited at the sacrificial rites—such as the consecration of the zoôthra, or holy water; of the bareçona, or bundle of twigs of a particular tree; the preparation of the sacred juice of a plant called homa—the Indian *Soma* (q.v.)—taken to be an emblem of immortality; the offering of certain cakes, etc. The whole of the *Yazna* now comprises 72 chapters, probably corresponding to the (twelve times six) “seasons” during which Ahuramazda created the world. It consists apparently of two parts belonging to different periods. The older is written in what Haug calls the Gâtha dialect (see ZEND), and was considered sacred even at the time when the other books of the Zend-Avesta were composed. This “older *Yazna*” was divided again into the *Gâthas* and some minor pieces. The former, five in number, are small collections of (metrical) sacred prayers, songs, and hymns, exhibiting philosophical and abstract thoughts about metaphysical subjects. The name itself signifies “song.” Their meter resembles chiefly that of the Vedic hymns. They are without rhymes, and only the syllables are counted. The first bears the heading (which is also intended for the other four), “The Revealed Thought, the Revealed Word, the Revealed Deed of Zarathustra the Holy; the Archangels first sang the *Gâthas*.” They are all more or less devoted to exhortations on the part of the prophet to forsake polytheism (the *devas*, or gods), and to bow only before Ahuramazda. The difference between monotheism and idolatry is pointed out

in the respective sources whence they flow—viz., “existence” and “non-existence.” The mission, activity, and teaching of Zoroaster are dwelt upon more or less in all Gâthas, but chiefly in the second. To the other portion belongs further the “Yazna of seven chapters,” which seems to have been composed by early disciples, and which consists of prayers in prose, addressed to Ahuramazda, the angels, the fire, the earth, the waters, and other spiritual beings—genii presiding over the different parts of the good creation; further, over devotion, speech, etc. There is further a chapter containing a formula by which the ancient Iranians were received into the new religious community. The so-called younger Yazna, written in the common Zend language, is of more varied contents, such as, an invitation to Ahuramazda and all the good spirits to be present at the sacrifice; further, pieces referring to the preparation and drinking of the homa juice; next, the praises of the genius Serosh, and a commentary on the most sacred prayers. The *Visparad*, which forms the next most important part of the Zend-Avesta, contains a collection of prayers, composed of 23 chapters, written in Zend (not Gâtha), and resembling the younger Yazna. They refer to the same ceremonies—the preparation of the sacred water, consecration of certain offerings, etc. Next are to be considered the *Yashts*, in 24 divisions. *Yasht* (*yésti*) means worship by prayers and sacrifices, and in the Avesta indicates certain laudations of sacred persons and objects—*yazatas* (*izad*) = angels, and in so far different in nature from the invocations in the Yazna and Visparad, that, while in the latter the divine beings are invited promiscuously, the single *Yashts* are addressed to individual numina, such as the archangels, the sun, the heavenly water, the star Tisfrya, etc. In these songs—the work of Median bards, probably—are also found the primary sources of the legends contained in the Shâh-nâmeh (q.v.). Before speaking of the Vendidad, the “Pentateuch” of the Zoroastrian “canon,” we shall yet briefly mention some smaller pieces, which are now used as common prayers by the Parsees, such as the five *Niyâgish*, or praises, addressed to the sun, the moon, the water, and the fire; the *Afrîgâus*, or blessings to be recited over a certain meal prepared for an angel or a deceased person; the five *Gâhs*, or prayers to the angels set over the five different times of the day and night; and finally, the *Sirozah*, or thirty days, being a calendar, or rather an enumeration of the thirty divine beings that preside over each of the days. It is chiefly recited on the thirtieth day after the death of a man. The *Vendidad*, to which we now turn, is the code of religious, civil, and criminal laws of the ancient Iranians. It consists of 22 chapters or fargards = sections. It seems to have survived in a fragmentary state only, and is evidently the work of many hands and many centuries. It appears as if, starting from old sayings in the Avesta, the Iranian high-priests in various periods had interpreted them often at variance with each other: these their interpretations (Zend) were made the theme of further interpretations (Pâzend), and the three phases of interpretation were received in the course of time as equally authoritative among the faithful. There are three parts to be distinguished in the Vendidad. The first is introductory, containing an enumeration of 16 Aryan countries over which the Zoroastrian religion was spread; further, legends of king Yuria, and recommendations of agriculture. The second part (chaps. 4 to 17) forms, as it were, the groundwork of the Vendidad, treating of laws, ceremonies, and observances. The third part is a kind of appendix, treating of various subjects, chiefly of a medical kind, such as spells against diseases, etc. Here also ought to be mentioned the *Bundehesh*, written entirely in Pehlvi, which seems a compilation of several extracts and fragments of partly ancient, partly recent Zoroastrian writings, forming a sort of compendium or dogmatic handbook of Zoroastrianism. For an account of the latter, we refer to GUEBRES, PARSEES, and ZOROASTER.—Burnouf, *Vendidad-Sadé*; Olshausen, *Vendidad Zend-Aveste*—French translation by Anquetil-Duperron, German by Klenker; Spiegel (the German text, with Spiegel's commentary, retranslated into English by Bleek); Rask, *Alter und Aechtheit der Zendsprache*; Haug, *Essays*, etc.

ZENGGE, SENJ, or SEGNA, an important free port of the Austrian empire, in Croatia, lies on the Adriatic, 71 m. s.e. of Trieste, at the termination of the Josephine road, opposite the island of Veglia. Zengge is the see of a Roman Catholic bishop, has a tolerably large and elegant cathedral, an upper gymnasium, a seminary for priests, an academy, and school of navigation; a small harbor (free), somewhat unsafe; and some trade in grain, honey, wax, wine, salt, tobacco, wood, fish, and cattle. Pop. '69, 3,496.

ZENITH, a word, like *nadir* (q.v.), borrowed from the Arabic, is the name given to that point of the heavens which is directly overhead, i.e. in line with the spectator's position and the center of the earth. It is thus the upper pole of the spectator's horizon, as the nadir is the under pole. The word would seem to be connected with the Arabic *san*, a “point.”

ZENJAN, a populous and thriving town of Persia, in the province of Irak-Ajemi, about 170 m. n.w. of Teheran, and 70 m. s.s.w. of the Caspian sea, on the table-land of Azerbaijan, at the junction of the roads from Hamadan and Teheran to Tabriz, on a tributary of the Kizil-Ouzen, which flows into the Caspian. It is surrounded by orchards, has old walls, a palace, a mosque, bazaars, and a trade in carpets, woolen cloths, arms, lead, and gunpowder. Pop. estimated at 15,000.

ZENO, a philosopher of Elea, a town of Lucania, in Italy, was a favorite disciple of Parmenides. He visited Athens, and the illustrious Pericles was one of his pupils. According to the account usually given, on his return to Elea, he joined a conspiracy to deliver his native town from the tyrant Nearchus, and on the failure of his plot, was captured, and put to the torture. On being interrogated as to his accomplices, he named the principal courtiers, and is said to have bit his tongue off, and spat it in the tyrant's face. However, the historical evidence for this account is unsatisfactory; and whether Zeno perished in his attempt or survived the tyrant is uncertain. He held the usual doctrines of the Eleatic school respecting the unity and the immutability of all things, distrust in knowledge acquired through the senses, and reliance on pure reason. He did not deny that there were phenomena or appearances, but he maintained that these were not real existences. In this he anticipated the Berkeleyan theory. But he is chiefly remarkable for having been the first to employ the style of argument known by the name of dialectics, in which error is refuted, and truth sought to be established, by the *reductio ad absurdum*—a method so skillfully employed afterward by Socrates and Plato. He devoted his great powers of argumentation to enforce the doctrines first broached by Xenophanes, and more systematically developed by Parmenides. His works were in prose, but only small fragments have been preserved.

ZENO, founder of the Stoic philosophy, was born at Citium, in Cyprus. The dates of his birth and death are uncertain. He flourished in the early part of the 3d c. b.c., and was a contemporary of Epicurus. His father was a merchant, and on his trading voyages brought home with him from Athens some writings of the Socratic school. By these, Zeno is said to have been attracted to the study of philosophy. At the age of 30 he was shipwrecked off the coast of Athens, and, having lost his property, he willingly adopted the Cynic doctrines, in which contempt for riches is conspicuously taught. He attached himself first to Crates, but soon became dissatisfied with the coarse, ostentatious disregard for established usages, and the indifference to speculative inquiry, which characterize the Cynic sect. He next joined the school of the Megaric Stilpo, and there became a proficient in the art of disputation. Still unsatisfied, he betook himself to Polemo the academician. Having thus made himself master of the tenets of the various schools, he proceeded to open a school for himself, wherein he might show forth the result of all his inquiry, and develop his own peculiar system. See **STOICS**. He selected for the purpose the "Painted Porch" (*Stoa Poikile*), from which his sect has got its name, and there, till his 98th year, as is said, continued to teach those doctrines, which, in spite of serious drawbacks, inculcate that manly energy and simplicity, fortitude under suffering, and reverence for moral worth, which made disciples of so many of the noblest characters among the Romans. As a man, Zeno deserved and gained the highest respect. The Athenians honored him with a gold crown and a public burial, and his countrymen erected a monumental pillar to his honor. Of his numerous writings scarcely anything remains, save the titles.

ZENO'BIA, Queen of Palmyra, succeeded (267 A.D.) her husband Odenatus, who had been acknowledged by Gallienus as his colleague in the Roman empire. Nearly the whole of the eastern provinces submitted to her sway. When Aurelian assumed the purple, he marched against her with a large army, and after defeating her in several battles, besieged her in Palmyra. Her hopes of being relieved by the Persians and Arabians being disappointed, she attempted to escape by flight, but was captured, 273 A.D. Before the conqueror, her courage failed, and she saved her own life by imputing the blame of the war to her counselors, especially the celebrated Longinus, who was accordingly put to death. Zenobia was led in triumphal procession at Rome, decked with splendid jewels, and almost fainting under the weight of gold chains. She was presented by her conqueror with large possessions near Tivoli, where, in the society of her two sons, Heronianus and Timolaus, she passed the rest of her life in comfort and even splendor. She was a woman of great courage, high spirit, and strikingly beautiful. With purity of morals in private life, she combined prudence, justice, and liberality in her administration. Her literary acquirements were considerable; she spoke Latin and Greek, as well as the oriental languages, with fluency. The balance of authority is said to be in favor of the belief that she was attached to the Jewish faith.

ZENTA, or **SZENTA**, a t. of Hungary, in the co. of Bacs, on the right bank near the Theiss, 120 m. s.s.e. of Pesth, in a beautiful plain. Cattle-breeding is carried on. Pop. '69, 19,938. It is celebrated for the victory of prince Eugene over the Turks in 1696.

ZEOLITE (Gr. *zeo*, to boil), the common name of a large group of minerals, often called the zeolitic family. They receive this name from their melting before the blow-pipe. They are all soluble in acids, and most of them gelatinize in acids in consequence of silica being set free. They are hydrated silicates of alkalies or alkaline earths, most of them containing alumina. Magnesia is rarely present in them. Their composition, however, is very various. They are generally found in amygdaloidal cavities, or in fissures of trap and other Plutonic rocks, as granite and gneiss, apparently as deposits from water percolating through the rock. They sometimes, but rarely, occur in veins. They are found either in crystals or of crystalline structure, often in plates or fine scales, often in needles or fibrous. Among them are *unalaime*, *natrolite* or *mesotype*, *scolezite* or *needlestone* (*needle zeolite*), *stilbite*, *heulandite*, *brewsterite*, *apophyllite*, *chabasite*,

harmotome or *cross-stone*, and *laumonite*. The number of species and varieties which have been described and have received distinct names is very large.

ZEPHANIAH (the name probably signifies a "watcher of the Lord"), a Hebrew prophet who flourished during the reign of Josiah, in the latter part of the 7th c. B.C. The subject-matter of his brief "prophecy" is the temporary desolation of Judæa ("I will utterly consume all things from off the land," i. 2), on account of the infidelity and worldliness of the inhabitants, Jerusalem being specially assailed by the author for her filth and pollution; the tyranny and the rapacity of her rulers, and the violence and treachery of her priests and prophets. At the same time the prophet predicts the destruction of the surrounding heathen nations, the Philistines, the Moabites, Ammonites, Ethiopia, and Assyria. The close, in which he declares that God will leave a righteous remnant in Israel, and for their sakes will ultimately bless the land with permanent peace, is couched in a strain of tender exaltation.

ZERBST, capital of the former duchy of Anhalt-Zerbst (see ANHALT), a t. of north Germany, in the duchy of Anhalt, 10 m. n.w. of the town of Dessau, and 68 s.w. of Berlin, is situated on a level sandy spot on the river Nuthe, a tributary of the Elbe. In place of the ancient walls, promenades now encircle the town. Close by is a beautiful large palace, the ducal residence. The town has 4 Protestant churches, a Roman Catholic one, and a synagogue. The church of St. Nicholas is a beautiful specimen of Gothic architecture. The town is the seat of a court of justice; has a high school, called the Francisceum; female, industrial, and other schools; a house of correction, and orphan asylum, hospitals, and a workhouse. The chief manufactures are articles in gold and silver, silk, wax, soap, stoneware, carriages. There are many breweries, whose produce is exported in large quantities. The vegetable products are considerable, and the culture of hops is carried on. Handsome baths have been erected over a mineral spring recently discovered here. Pop. '75, 12,878.

ZERO, a term in thermometry applied to certain points of temperature. The centigrade zero is the temperature of melted ice. Fahrenheit put his zero at the point indicated by his thermometer in a mixture of mixed snow and salt, supposing such point to be absolute zero. The centigrade thermometer zero is the temperature of water formed by ice at the exact moment of its fusion. See THERMOMETER, *ante*.

ZETLAND. See SHETLAND, *ante*.

ZEUGLONON, or **BASILOSaurus**, an extinct mammal allied to the whale. It lived during the eocene tertiary period. Its remains have been found in Georgia, Alabama, Mississippi, and Louisiana. A vertebral column 70 ft. in length with some bones of the head, ribs, etc., was obtained by Dr. S. B. Buckley in Clark co., Ala., in 1842. It is now in the museum of the late Dr. Warren at Boston, Mass. Some of the larger vertebræ are a foot and a half long and a foot in diameter. It is one of the largest fossil animals known. In Clark co., Ala., its bones were so many, scattered over the surface, that some were burned and others placed in stone-walls.

ZEULENRO'DA, a t. of the German empire, in the little principality of Reuss-Greiz, 10 m. w. of the town of Greiz, and 51 s.s.w. of Leipsic, stands on a high plateau, in a wooded hilly district. Zeulenroda has suffered severely at various times from conflagrations, and is now regularly built, consisting of a handsome town and four suburbs. It has a spacious market-place with a beautiful court-house, two churches, a burgher and free school, and a hospital. Besides some bleach-works and a trade in cattle, there are manufactures of woolen goods, especially hosiery, the fineness of which is famous. Pop. '75 6,300.

ZEUS (Sanskrit, *dic*, light, *djaus*, heaven, *devas*, god; Lat. *Ju-piter* and *Dies-piter*, i.e., father Zeus; Ang.-Sax. *Tiu*, whence Tuesday) was the greatest of the national deities of Greece. According to the most received mythology, he was the son of Cronos and Rhea, brother of Poseidon and Hæra, the latter of whom was also his wife. He expelled his father and the older dynasty of the Titans; assumed the sovereignty of the world, and successfully resisted the attacks of the giants and the conspiracies of the gods. In the allotment of the world, after the dethronement of the Titans, Zeus gained the rule of heaven and air, Hades of the infernal regions, and Poseidon of the sea; while the earth was left subject to the influence of all three, though Zeus was regarded as having the supremacy throughout all departments. Crete, Dodona, and Arcadia were the places where the worship of Zeus was most cultivated; and although originally the inhabitants of these places may not have looked upon themselves as worshippers of the same god, yet, in process of time, all the local gods revered under the name of Zeus were at last merged in one great Hellenic divinity; a process which was carried still further out when he was identified with the Jupiter of the Romans and the Ammon of Libya.

Besides the epithets of Zeus from the seats of his worship, he had many titles applied to him from his various powers and functions, moral and physical. He was the father and king of gods and men; the protector of kings, of law and order; the avenger of broken oaths and of other offenses; he watched over the state, the assembly, the family, over strangers and suppliants; his hand wielded the lightnings and guided the stars; he ordained the changes of the seasons, and, in short, regulated the whole course of nature. All prophecy, too, was supposed to originate in him, and it was from him the

prophetic god Phœbus received his oracular gift. He dispensed, as it pleased him, both weal and woe to mortals; but whether he could control the Fates themselves is a point about which the ancients disagreed, as men have done in all ages where the question of free-will and fate is concerned. Of the many epithets applied to Zeus, perhaps the best known is the Olympian, from that Olympus in Thessaly whose summit was believed to be his residence as well as that of the other gods. His most celebrated festival was the Olympic, held at Olympia, in Elis, after the end of every fourth year.

Combined with such exalted conceptions of the majesty and power of Zeus, we find many stories current respecting his amours with mortals and immortals; he is represented as acting with caprice, anger, deceit. Probably, in many cases, an ancient Greek of average position and capacity did not view such matters with any very strong feeling of disapprobation. Others, again, as Xenophanes (q.v.), protested against the transference to the gods of human passions and failings; or, as Pindar, maintained that they would believe nothing of the gods that was discreditable to them; or, as Euripides, argued that such tales were sufficient to disprove their divinity; or, as Euhemerus, held that the local worship of Zeus, like that of other deities, was owing to the fact that divine honors were paid to deified men at the place of their burial, and that of course it was no wonder to find human actions assigned to gods who had once been human. In modern times the various myths were at one time explained as symbolical of various celestial and terrestrial phenomena, such as the apparent motion of the sun, the alternation of day and night, the changes of the seasons, and so forth. The most rational explanation is as follows: In early times, men thought and spoke of natural objects as if they were personal agents, employing names for them which were literally, not symbolically, significant. But from lapse of time, and the departure of various tribes from their original seats, in many countries the meaning of these words became obscured, and though men still used them, their real significance was forgotten, and terms which originally had expressed some process of nature were conceived to narrate some incident in the history of a person. For example, the expression that the sun follows the dawn was misunderstood, and gave rise to the myth of Phœbus pursuing the nymph Daphne, because the word Daphne was no longer understood. Such misconceptions were then, by successive ages, elaborated into myths more or less fanciful and even revolting. In this respect Zeus has fared no better, or rather much worse, than the other deities. In the same way as the Greek war-god Ares is a personage much inferior to the Latin Mars, so the serious and unimaginative Roman's conception of his majestic Jupiter Optimus Maximus (the best, the greatest) was more elevated than that conceived of Zeus by the sensuous Greek. But this might be expected from the different character of the two peoples. Except in the grander attributes of omnipotence and fatherly care of the universe, we can trace little in common; for the Jupiter of the Latin poets, as portrayed in Virgil and Ovid, is drawn entirely from Greek sources, and is merely the Zeus of Greek mythology with an altered name.

ZEUXIS, the celebrated painter, was b. at Heraclea, probably the city of that name in Lucania. He is also styled of Ephesus, which means that he belonged to the Ionian school of painters. He flourished in the latter part of the 5th c. B.C., and was at Athens about the beginning of the Peloponnesian war. He excelled in the treatment of light and shade, in accuracy of imitation of natural objects, and in expressing the perfection of human, and particularly female beauty. This last he effected by selecting the finest models he could find for each separate part. His most famous pictures were "Zeus enthroned, with the Gods standing round;" "Helen;" "The Infant Hercules strangling the Serpents;" "The Female Hippocentaur." By the exercise of his art, he attained to great riches and fame, and, like his rival Parrhasius, was exceedingly conscious of his pre-eminence. He repeatedly presented rather than sold pictures to cities that were anxious to possess them, because he thought no money-price could pay for them. Greece was plundered of many of his masterpieces by her Roman conquerors; and one of the noblest, the "Hippocentaur," was lost on the passage to Rome. Designs on vases, sarcophagi, and other works of antiquity exist adorned with representations of the same subjects as Zeuxis painted, and probably were imitated from his productions.

ZEYST, a large village in the Netherlands, province of Utrecht, is surrounded by beautiful well-wooded estates and country-seats, the summer residences of many of the first families of Amsterdam. The industries are making soap, candles, and vinegar, brass and zinc founding, etc. On a rising ground, and surrounded by fine old trees, stands the Dutch Reformed church, built in 1180. There is also a Roman Catholic church. In 1746 a society of Moravian brethren settled at Zeyst, where they have built a separate quarter, consisting of public and private buildings, erected along the sides of two large grassy squares, called the Easter plain and the Wester. Besides the church, there is an excellent day and boarding-school, which is resorted to by children of parents belonging to various Protestant communions. The unmarried members live, the males in the brothers' house, the females in the sisters' house. Another building is set apart for widows. There are also family residences, work-shops, and warehouses. In 1870 the pop. of Zeyst numbered 5,440; in 1875, 5,547.

ZHITOMEE. See *JITOMIR*, *ante*.

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ZIEM, FÉLIX, b. France, 1822; studied painting in Paris and in Italy. His pictures of subjects taken from Venice, Constantinople, and the east are much admired. Among them "The Grand Canal of Venice" and "View of the Bosphorus" deserve mention.

ZIE RIKZEE, an old and important town in the Netherlands, province of Zeeland, is situated in the s.e. of the island of Schouwen. It was fortified before the beginning of the 11th c., and owed its rise and prosperity to the shipping-trade and fishing. The walls have been leveled, planted with trees, and formed into shady walks. Zierikzee has two havens, the old and the new, two Dutch Reformed churches, a Lutheran, a Roman Catholic, a small dissenting church, and a Jewish synagogue. There are a grammar-school, school of design, and other excellent public schools maintained by the town. The principal means of living are trade in agricultural produce, shipping, ship-building, fishing, weaving calicoes, beer-brewing, drying madder, sawing wood, grinding corn, etc.

Zierikzee suffered severely in the contests between Flanders and Holland for the possession of Zeeland. In 1303 the Flemings besieged it with a large army, but were compelled, by count William of Holland, to retire, Aug. 10, 1304. In the long war of independence, after an obstinate defense, the Spaniards took Zierikzee, July 2, 1576. Pop. '70, 7,834; '75, 8,043.

ZIETHEN, HANS ERNST KARL, Count, 1770-1848; b. Prussia; became a soldier, and in the wars with Napoleon I., 1813-15, showed great ability as a general. He commanded a corps at Waterloo and checked Ney's advance. He afterward was at the head of the Sedan army of occupation. For his services he was made a count and commander-in-chief in Silesia.

ZIGZAG, in military science, a trench of approach against a fortress; so constructed that the line of trench may not be enfiladed by the defenders. See SIEGE.

ZIGZAG, a decoration characteristic of the Norman style of architecture. It consists of one or more moldings running in zigzag lines, and is used with great effect. The zigzags are employed in great profusion, and are sometimes undercut so as to be detached from the moldings.

ZILLEH, ancient *Zela*, a t. in Asiatic Turkey, in the pashalic of Sivas, about 30 m. w.s.w. of Tokat. It is built on a height, with a small flat conical hill in the center of the town, which is evidently the mound or road, of which another portion is still seen at Thyana, the construction of which was attributed to Semiramis. Scarcely any remains of antiquity are to be found here; an ugly fortress of the middle ages having usurped the place of its beautiful temple. This was the field of Julius Caesar's battle with Pharnaces, of which he wrote "Veni, vidi, vici." There are several large khans, and manufactures of coarse cottons. Its annual fair, of 15 or 20 days, from the middle of November, is often frequented by 40,000 or 50,000 persons from the commercial towns of Asiatic Turkey. There are about 2,000 houses, the population being almost entirely Turkish.

ZILLERthal, one of the principal valleys of the Tyrol, traversed by the Ziller, is about 50 m. long. Toward the s. and s.w., it is bounded by lofty glaciers; but toward the n., where it opens into the valley of the Inn, it is tolerably fertile. Among the eight secondary valleys are the Duxerthal—famous for its precipitous glaciers, 1200 feet high—and the Zemthal, both remarkable for several great waterfalls. The inhabitants of the Zillerthal, who number about 15,000, are celebrated even in the Tyrol for their handsome, well-built figures; and their fine Alpine songs are well-known and appreciated in London and Paris. The chief wealth of the Zillerthal is derived from the rearing of cattle. About 5,000 head of cattle are exported yearly; but, notwithstanding, the valley is not able to support its numerous population. Many of the men hire themselves out as servants for the summer, while others go about as peddlers, selling essences of herbs and gloves, of which 10,000 pair are made yearly. The principal towns are Zell and Mairhofen. For some years, the valley has been much visited by artists, chiefly from Munich.

In recent times, the inhabitants of Zillerthal acquired considerable notoriety by a part of them leaving the Roman Catholic church, and emigrating. For a considerable time, they had been in the habit of reading the Bible, and were on friendly terms with the Protestant church, although still attending the Roman Catholic service; but when, in 1826, the Catholic clergy began to enforce auricular confession with greater strictness, a number of them thought seriously of going over to the Protestant church. Ere long, they not only objected to the confessional, but to the worship of the saints, absolutions, masses for the soul, purgatory, etc. In 1830, they began to leave the church; and by 1832, the number of dissenters had amounted to 240. The emperor Francis, to whom, on his visit to Innsbrück in 1832, they addressed a petition regarding their religion, promised them toleration; but after considerable delay, they were told (1834) that they must either return to the Catholic faith or remove to Transylvania, where there were Protestant congregations. As the Zillerthalers could not agree to this, they formed the resolution, as the Protestants of Salzburg had once done, of seeking a refuge in Prussia. This was granted; and the Zillerthalers, who had been allowed by the

Austrian government to sell their property, set out Aug., 1837, for Prussia. In all, 399 men, women, and children arrived, Oct. 2, at Schmiedeberg, in Silesia, where they were to stay until the arrangements for their reception in Ermansdorf were completed. The king gave them 22,500 thalers (£3,375) on their settlement, and (1839) made them a further grant of 12,500 thalers (£1,875) for a church and school. The colony received the name of Zillerthal, and in 1871 numbered over 400 inhabitants.—See *Geschichte der Zillerthaler Protestanten* (Nuremb. 1838); Rheinwald; *Die Evangelischgesinnten in Zillerthal* (4 Aufl., Berl. 1838).

ZIMB, a dipterous insect, exceedingly destructive to cattle in Abyssinia, as the tsetse (q.v.) is in more southern parts of Africa. It probably belongs to the same family, but this has not yet been ascertained. It is supposed to be the *zebub* of the Hebrew Scriptures (Is. vii. 18). Bruce describes it as very little larger than a bee, but thicker in proportion; the wings broader, and without color or spot; the head large; the upper lip sharp, having at the end of it a strong pointed hair, a quarter of an inch long; the lower lip with two similar bristles. The flight of the insect resembles that of the gadfly, and is attended with a peculiar buzzing. The zimb is found only where the soil consists of a rich black loam; but all the inhabitants of the sea-coast, along the southern shores of the Red sea, and southward beyond cape Guardafui, are compelled to remove their cattle in the rainy season to the nearest sands, in order to prevent their destruction by this pest, as well as those of more inland districts from the mountains of Abyssinia northward to the confluence of the Astaboras and the Nile. "As soon as this plague appears, and their buzzing is heard," Bruce says, "all the cattle forsake their food and run wildly about the plain till they die, worn out with fatigue, fright, and hunger." The camel, the elephant, and the rhinoceros are liable to the attacks of the zimb, as well as the ox; but the elephant and rhinoceros protect themselves by rolling in mud, which, when dry, coats them as a kind of armor.

ZIMMERMAN, JOHANN GEORG, a native of the town of Brugg, in the Swiss canton of Bern, in which his father was a senator, was b. Dec. 8, 1728. He was educated at home in the first instance, and afterward at Bern, preparatory to his going to the university of Göttingen to study medicine. This he did in the year 1747. By his countryman, the celebrated Haller, he was kindly welcomed; he became an inmate of his house, and had the advantage of his valuable aid in the prosecution of his studies. In these he displayed the utmost ardor, not content to confine himself to medicine, but aiming at a large and liberal culture. In his specialty, so great was the proficiency attained that on his taking his degree of doctor, in 1751, he published a work entitled *Dissertatio Physiologica de Irritabilitate*, which not only at the time attracted attention by its originality of view, but even now is held to be not without value. In 1752 he began to practice as a physician at Bern with every prospect of success; but shortly after, the post of public physician falling vacant in Brugg, his native place, he was induced to transfer himself thither. About this time he was married to a relation of his friend and preceptor, Haller. Despite the extensive practice he speedily acquired, with such a reputation for skill as brought patients from a great distance to consult him, he continued to cultivate other pursuits; and in 1756 he published a miscellany of prose and verse, remarkable as containing the first sketch of his treatise *On Solitude*, which afterward became so famous. In 1758 appeared his work on *National Pride*, an ingenious and able dissertation, which immediately became popular and carried the name of the writer, by translation, into nearly every country in Europe. That he did not, however, neglect his special department of study was proved in 1763 by the appearance of an elaborate work on experience in medicine (*Von der Erfahrung in der Arzneikunst*; Zurich, 2 vols. 8vo). Of this the great value was instantly recognized, and it still continues to enjoy some portion of its first reputation. Zimmerman was now a man of European note; and among other advantageous offers made to him was that of the post of physician to the king of Britain at Hanover, with the title of aulic counselor attached to it. This he accepted; and to Hanover he accordingly went in 1768. His repute as a physician continued here to increase, and from all quarters came flocks of people to have the benefit of his advice. In 1770 he had the misfortune to lose his wife, and this distress was complicated by an attack of an internal malady, which soon after obliged him to go to Berlin to undergo a perilous operation. This was successfully performed, but did not preclude a return of the complaint some time after. His only daughter now died; and a son who survived sunk under the influence of disease into something like entire idiocy. Zimmerman, who had almost from his very boyhood had to struggle against a constitutional melancholy, became now, as it almost seemed, a confirmed and hopeless hypochondriac. From this deplorable state he was rescued for a time by a second marriage, into which his friends persuaded him; and as fruit of his revived interest in life he gave to the world, in 1784, his celebrated work *On Solitude* (*Ueber die Einsamkeit*; Leipzig, 4 vols. 8vo), a book which speedily became a popular favorite throughout Europe. In 1786 he was invited by Frederick the great, then in his last illness, to attend him at Potsdam. On going thither, he found that the case of the king was beyond the reach of his art. He remained, however, for some time; and as the result of his sojourn, he published in 1788 and 1790 two works on Frederick the great, the manifold indiscretions contained in which involved him in much painful and acrimonious controversy. In excuse of

much in the books not easily to be defended, everything seems to show that they were merely the first indications of a return of his constitutional malady in an aggravated and, as it proved, a finally intractable and hopeless form. His melancholy hallucinations continued to grow upon him, till he was at length little better than a mere maniac; and on Oct. 7, 1795, he died at Hanover. During these last sad years he had continued at intervals to write and publish; but in everything thus produced there was evident the wreck of his once brilliant faculties. As a physician, a philosopher, a man of general accomplishment, and a writer of singular power and felicity, Zimmerman was unquestionably one of the most remarkable figures of his time. Of Zimmerman on *Solitude* every one must needs have heard; it no longer retains the immense popularity it once had; but along with his more expressly medical treatises, which are of interest—if not very much now otherwise—in relation to the history and development of his profession, it must still continue for a time to perpetuate the name of its writer.—See *Zimmerman's Eigene Lebensbeschreibung* (Autobiography, Han. 1791); Tissot, *Vie de Zimmerman* (1797); Wichmann, *Zimmerman's Krankengeschichte* (1786); Bodemann, *J. G. Z.* (1878).

ZIMMERMANN, ALBERT, b. Saxony, 1809; studied art in Munich, and in 1837 was made a professor in the Milan academy. His best pictures are landscapes, and the most famous are "The Brocken and its Witches," "The Finding of Moses," and "Mountain View during a Storm."

ZINC (Zn, eq. 32.5—new system, 65—sp. gr. 6.8), or *spelter*, as it is often called in commerce, is a hard bluish white metal, lustrous externally, and when broken exhibits a foliaceous crystalline fracture. At ordinary temperatures it is somewhat brittle; but when heated to above 212° it becomes perfectly ductile and malleable, and may be drawn out into wire or beaten into thin plates. At about 400° it again becomes so brittle that it may be easily pulverized. It fuses at 773°, and at a white heat may be volatilized; and if the vapor be exposed to the air, it burns very brilliantly, and is converted into oxide of zinc, which is deposited in copious white flakes. The temperature of its boiling-point is estimated by Deville at 1904°. On exposure to the air, zinc soon loses its metallic luster and assumes a gray appearance, in consequence of its surface becoming oxidized, while the metal beneath is thus protected from further change—a property which renders this metal especially useful for many economical purposes. It has no action on water at ordinary temperatures, but if a mineral acid be present it readily decomposes water, and is employed to decompose the water of dilute sulphuric acid when hydrogen is required. Moreover, a hot solution of potash acts on zinc, hydrogen being liberated while oxide of zinc is formed and dissolved in the alkaline solution. Zinc precipitates from their solutions most of the electro-positive or basylous metals less oxidizable than itself.

This metal is never found in the native state; the chief ores from which it is extracted are noticed below.

The commercial zinc obtained by the ordinary methods of extraction usually contains a small quantity of lead, iron, and carbon, with occasional traces of arsenic and copper. In order to obtain it in a chemically pure state, a stream of sulphureted hydrogen is passed through a slightly acidulated solution of sulphate of zinc, and after the removal of any precipitate that may be found, the solution is boiled so as to expel the gas, after which the zinc is precipitated in the form of carbonate, by the addition of carbonate of soda. The carbonate is converted by ignition into oxide of zinc, which must be distilled in a porcelain retort with the purest available form of carbon, as, for example, charcoal prepared from loaf-sugar.

Zinc is commonly regarded as forming only one compound with oxygen—namely, the *protoxide of zinc* (ZnO), although it has been suggested that the film which is formed upon the surface of metallic zinc by exposure is a sub-oxide. Protoxide of zinc is obtained by heating the metal in the air, the white oxide thus obtained being formerly known as *lana philosophica*, from its woolly appearance; while it was known as *flores zinci*, or *flowers of zinc*, in pharmacy. The process of manufacturing this oxide, when it is required as a pigment, consists, as prof. Miller remarks, "in distilling zinc from clay retorts into chambers through which a current of air is maintained. The volatilized metal burns at the high temperature to which it is exposed under these circumstances; and the oxide is deposited in a series of condensing chambers."—*Inorganic Chemistry*, 3d ed. p. 545. The pigment thus obtained is known as *zinc white*. The impure oxide of zinc, commonly known as *tutty*, is obtained from the flues of furnaces in which brass is melted. A hydrated oxide of zinc (Zn.HO) is precipitated in a white gelatinous mass from the solution of the salts of zinc by the addition of potash or soda, but redissolves in an excess of the alkali. Oxide of zinc is readily soluble in acids, and is capable of being reduced by charcoal, but not by hydrogen. The most important salts formed by oxide of zinc are the sulphate and carbonate. *Sulphate of zinc*, or *white vitriol* (ZnO.SO₄ + 7Aq), occurs in large transparent, glistening, four-sided prismatic crystals, resembling those of Epsom salts. At a temperature a little below 212°, the crystals lose six equivalents of their water of crystallization, at a somewhat greater heat, they lose their last equivalent, and previously to losing their water of crystallization, they fuse in it. This salt is readily soluble in water, requiring 2½ parts of the latter for its solution at 60°. It is obtained in considerable quantity as a residue in the process

of obtaining hydrogen from dilute sulphuric acid and zinc; and it is prepared on the large scale by roasting and lixiviating zinc-blende or sulphide of zinc, which, when heated in the presence of air, is oxidized into the sulphate. *Carbonate of zinc* (ZnO, CO_2) constitutes one of the most important of the zinc-ores—viz., the common or rhomboidal variety of *calamine*, a name which is derived from the property which this substance possesses of adhering after fusion in the form of reeds to the base of the furnace. Carbonate of zinc may be artificially prepared by precipitating a salt of oxide of zinc with carbonate of soda, when the required salt falls as a white precipitate; this is, however, not simple neutral carbonate, but a basic carbonate, having the composition expressed by the formula $2(\text{ZnO}, \text{CO}_2)$, $3(\text{ZnO}, \text{HO})$. Of the haloid salts, the *chloride of zinc* (ZnCl), formerly known as *butter of zinc*, is the only one requiring notice. This salt is obtained in the anhydrous form by burning zinc in chlorine gas, and in the hydrated state by dissolving zinc in hydrochloric acid, and evaporating the solution, chloride of zinc being thus formed, while hydrogen escapes in the gaseous form. In the anhydrous state, it forms a whitish-gray, semi-transparent mass, which fuses readily, and sublimes at a high temperature. When exposed to the air, it soon deliquesces, and is soluble in water in all proportions. The watery solution has a burning and nauseous taste, and in a concentrated state acts as a powerful caustic. It may be crystallized with 1 equivalent of water from its aqueous solution; and it is soluble in alcohol. It forms double salts with the chlorides of sodium, potassium, and ammonium; and a concentrated solution of the double chloride of zinc and ammonium ($\text{H}_4\text{NCl} + \text{ZnCl}$) is much used for the purpose of removing the film of oxide from the surface of metals, such as zinc, iron, or copper, which are to be united by the operation of soldering.”—Miller’s *Inorganic Chemistry*, 3d ed. p. 546. With sulphur, zinc forms only one combination—viz., *sulphide of zinc*, or *blende* (ZnS), which is one of the most abundant of the zinc minerals. Blende, when pure, is of a pale brown color, but it is commonly blackish from admixture with sulphide of iron. It usually occurs crystallized in rhombic dodecahedra, or allied forms, but sometimes is found in the massive state. Sulphide of zinc may be obtained artificially as a white precipitate, which, on drying, becomes yellow, by the addition of sulphide of ammonium to a solution of a zinc-salt. Zinc forms several important alloys, among which *brass* (consisting of 2 parts of copper to 1 of zinc) and *German silver* (q.v.) may be specially noticed. Prof. Miller sums up the characters of the salts of zinc as follows: “The salts of zinc are colorless; their solutions have an astringent, metallic taste, and act rapidly as emetics. They are distinguished by giving no precipitate in acid solutions with *sulphureted hydrogen*, but they yield a white hydrated sulphide of zinc with sulphide of ammonium.”

Manufacture.—That the Romans were acquainted with the art of making brass—an alloy of copper and zinc—is proved by the analysis of some of their coins struck soon after the commencement of the Christian era. Yet zinc itself was not known in Europe as a distinct metal until Paracelsus described its distinctive properties in the 16th century. Probably the Roman brass was produced by smelting ores containing both zinc and copper, some of which are at the present day smelted in Sweden. Zinc, however, was brought from the east by the Portuguese long before it became an article of commerce in Europe, and is supposed to have been known and made into articles of use and ornament both in India and China from an early period.

There are several ores of zinc, but only two of much importance—viz., blende and calamine. Blende, black-jack, or sulphuret of zinc, contains, when pure, about 67 per cent of zinc, but, like most ores, it is rarely found pure. The usual composition of English blende is zinc 61, iron 4, and sulphur 33. It occurs in all the older geological formations, and is often associated with the ores of copper and tin, but most frequently with lead ore—occurring, of course, like these in veins. Blende crystallizes in the form of the rhomboidal dodecahedron. The crystals have considerable brilliancy, but their luster is waxy rather than metallic. In this country it is usually of a dark color, from the sulphuret of iron which it contains—hence the miners’ name of *black-jack*. Sometimes it is sufficiently argentiferous to allow of the profitable extraction of the silver. Blende is found in Wales, Isle of Man, Cornwall, and Derbyshire. It is also found in a good many localities on the continent—Sweden, in particular, being rich in this ore.

Calamine, or carbonate of zinc, contains, when pure, 52 per cent of zinc, but it varies much in the proportion of metal which it contains on account of impurities. Its primitive crystalline form is the rhombohedron, but calamine as well as blende occurs more frequently massive than in crystals. It is usually either of a dull yellow or reddish-brown color. Like some other useful substances, calamine was formerly exported from England as ballast, through ignorance of its value. It was at one time raised to a considerable extent in Somersetshire, Derbyshire, and Cumberland, but it is chiefly the last county which produces it now. Belgium, Silesia, and Carinthia are well-known continental localities; and, quite recently, most extensive deposits of it have been discovered on the N. coast of Spain, which are estimated to last for ages.

Red oxide of zinc is found in New Jersey, where it is smelted. This is an oxide of zinc with a small quantity of oxide of manganese, which gives it its red color. Silicate of zinc, or electric calamine, is another rare ore, generally associated when found with calamine. It is said to be smelted in the United States, and to yield very pure zinc.

There are several distinct processes for the extraction of zinc from its ores, and of these the English, the Belgian, and the Silesian are the most important. The English process is as follows: The zinc ore (blende or calamine) is crushed between rollers to the size of hazel-nuts, and then roasted for about 12 hours, with occasional stirring, in a calcining furnace. The furnace in which the roasted ore is reduced very much resembles a glass-furnace. It is either circular or octagonal in form, and usually contains six pots or crucibles, made of Stourbridge fire-clay, about 3 ft. high by 2½ ft. in their widest diameter. In the bottom of each pot there is an opening, from which a sheet-iron tube, in two pieces, descends about 8 ft., and under its open end there is a sheet-iron vessel to receive the condensed zinc. Zinc being volatile at high temperatures, is smelted by distillation, and in the English process it is called distillation *per descensum*. An entire charge—that is, a charge for the whole six pots—consists of one ton of calcined ore mixed with a proper quantity of ground coke. When the pots are charged, their covers are fixed and luted on, the conical portion of the descending pipe being previously securely fixed and lined with fire-clay. The hole in the bottom of the pot is plugged with wood, which becomes converted into charcoal by the heat, and is then sufficiently porous to allow the zinc vapor to pass down, while at the same time it stops the descent of the coke or ore. The heat of the furnace is gradually raised, and soon produces vapor of zinc in the pots, which condenses as it descends the pipes, and drops into trays placed at the bottom of each pipe. Sometimes a tube becomes stopped by a lump of zinc, and when this happens, the furnace-man melts it with a bar of red-hot iron. It takes nearly three days to work off the above charge, which yields about 8 cwt. of zinc, and requires about 25 tons of coal for its distillation. It is necessary to watch the pots with great care while the process is going on, as any leakage usually causes much loss of zinc. The *rough zinc*, as it is called, is removed from the pans, where it accumulates in lumps, and melted in cast-iron pots. It is then well stirred and skimmed, and finally cast into ingots or cakes of the ordinary commercial size—the skimmings being worked over again with a new charge of ore.

The Belgian furnace differs greatly in its construction from the English. It consists of from 60 to 80 small fire-clay retorts, each about 3 ft. 6 in. long, by 8 in. in diameter, and set in a series of rectangular compartments, filling up an arched chamber. There is a clay nozzle or condenser attached to the front of each retort, and on the end of this nozzle there is a sheet-iron receiver for the condensed zinc, with a pit to collect the residue from the retorts. The retorts are charged with ground and roasted calamine, mixed with small coal free from sulphur. As the upper retorts receive less heat than the lower ones, they are not so heavily charged, and they are, moreover, supplied with less pure ores. At the end of every six hours the receivers are emptied of their melted zinc. In this process, a ton of ore can be smelted in 24 hours, and the yield from it is about 40 per cent of metallic zinc.

In the Silesian furnace, fire-clay retorts, about 4 ft. long by 1 ft. 6 in. in diameter, are arranged in two rows, back to back, and placed horizontally on a flat furnace bed, with a fire-place on a lower level running along between the backs of the retorts. A condensing apparatus comes away with a curve from the upper part of the front of each retort, and descends some 2 ft. below it. From this, the zinc, on condensing, drops on the ground, or into a tray placed to receive it.

With regard to the comparative merits of these three processes of smelting zinc, no very decided opinion appears to be yet arrived at by those who have the best means of judging. The Belgian process consumes the least fuel, but requires the greatest amount of labor; the English, on the other hand, is worked with the least amount of labor, but requires the most fuel; while the Silesian holds a sort of middle position between those extremes. Each, however, has minor advantages and disadvantages which the others have not. All three processes are in use in England.

Zinc, at ordinary temperatures, is a comparatively brittle metal; but about the beginning of the present century, it was discovered that, if heated to between 200° and 300° Fahr., its malleability and ductility were so increased that it could be rolled with facility into thin sheets, or drawn into fine wire. Since this was known, the uses of the metal, which formerly was only employed along with copper to make brass, have become greatly extended. In sheets, it is used for roofing, baths, water-tanks, spouting, and the like; also for covering ships' bottoms instead of copper. A considerable quantity is consumed for name-plates, for engraving upon, and for galvanic batteries. Perforated sheets with various ornamental patterns are manufactured for screens, blinds, light fences, and similar objects. As a material for casting artistic works, zinc possesses the desirable properties of having a low melting-point, and of taking a sharp impression from the mold, so as to require but little labor from the chaser; it has also considerable hardness. It has, in consequence, become a favorite material on the continent for making casts of statues, statuettes, and different kinds of ornaments.

Of late years, zinc has been applied with great success to the coating of sheet-iron for roofing and other purposes, and also for coating various kinds of iron wire, especially telegraphic wire. See GALVANIZED IRON.

We may remark here, that when zinc is exposed to a moist atmosphere, its surface becomes coated with a thin compact film of oxide or rust, which protects the metal

beneath from further oxidation, whereas the rust of iron appears rather to penetrate the body of the metal with greater ease when it has once begun. Hence the value of zinc as a material for roofing, and also for protecting the surface of iron roofs.

The average annual produce of the zinc mines of the United Kingdom, for several years past, may be taken, in round numbers, at 15,000 tons of ore, yielding about 4,000 tons of zinc, of the value of from £80,000 to £100,000, according to the market price of the metal, which has varied considerably. Our imports, in like manner, have amounted to about 15,000 tons annually of metallic zinc, the greater part of which came from Prussia, Belgium, and Holland.

Oxide of zinc is now employed to a large extent as a white pigment. It is of a purer color than white lead, does not tarnish and blacken like it with sulphureted hydrogen, and is much healthier for operative painters, but unfortunately it is deficient in body. It is also used as an ingredient in pottery colors. An impure sulphate of zinc, known as *white vitriol*, is also employed in various arts.

Medical Uses.—In its purely metallic state, zinc produces no effect upon the animal economy, but several of its compounds are very active medicines. As a matter of convenience, we shall consider these compounds alphabetically, beginning with *acetate of zinc*, a salt not considered in the article on the chemistry of this metal. It is obtained by dissolving, with the aid of heat, carbonate of zinc in a mixture of acetic acid and distilled water, filtering the liquid while still hot, and setting it aside to crystallize. In this process, the carbonic acid of the carbonate of zinc is displaced by the acetic acid, and escapes with effervescence. The salt is obtained in thin, translucent, and colorless crystalline plates of a pearly luster, with a sharp unpleasant taste, soluble in water, from which it may be precipitated, pure white, by sulphureted hydrogen, and evolves acetic acid when decomposed by sulphuric acid. The crystals contain three equivalents of water, and their composition is represented by the formula, $\text{ZnO}, \text{C}_2\text{H}_3\text{O}_2 + 3\text{Aq}$. Acetate of zinc is not much employed internally, but it is one of the most valuable local astringents, and is especially useful (in the form of solution of from 3 to 5 grains in an ounce of water) in the treatment of skin-diseases attended with much discharge, such as eczema, impetigo, etc., when the first inflammatory symptoms have subsided; and it forms a useful astringent in the milder form of ophthalmia. It was the active ingredient in sir Astley Cooper's celebrated injection for gonorrhœa in the third week—six grains of sulphate of zinc mixed with four fluid ounces of dilute solution of subacetate of lead, when sulphate of lead is precipitated, and acetate of zinc is held in solution. When employed as an ointment in skin diseases, from 4 to 10 grains finely powdered may be rubbed up with cold cream or simple ointment. *Carbonate of Zinc* is obtained for pharmaceutical purposes by the decomposition of sulphate of zinc in solution and carbonate of soda, when the carbonate of zinc is precipitated as a white, tasteless, inodorous powder, insoluble in water, but soluble with effervescence and without residue in dilute sulphuric acid. This preparation has been introduced as a substitute for *native calamine*, which formerly had a high reputation, but was so frequently adulterated as to render an officinal salt of known composition very desirable. Either in powder, or in the form of ointment, it forms an excellent astringent application for the treatment of intertrigo (or chafing of the skin), excoriations, and chronic skin diseases attended with much discharge. *Turner's cerate*, although not in the pharmacopœia, is in general use as a drying and healing ointment, and is one of the most popular remedies for superficial burns and sores. It is made by taking prepared calamine (or carbonate of zinc) and wax, $7\frac{1}{2}$ ounces of each, and olive oil 1 pint. Melt the wax, and mix the oil with it, then remove them from the fire, and when the mixture begins to thicken, add the calamine, and stir constantly till they cool.

Chloride of zinc, in the form of colorless opaque rods, obtained by pouring the concentrated solution into proper molds, is used in surgery as a powerful caustic in cases of cancer, fungous growths, etc. In toothache caused by caries, a minute portion of chloride of zinc introduced into the cavity of the tooth after the removal of the diseased parts, affords almost immediate relief. In consequence of its powerfully destructive properties, it should never be applied except by the surgeon. The solution of this salt, commonly known as *Burnett's disinfectant fluid*, is of much use in the sick-room or hospital ward as a deodorizing agent: as, however, it possesses strong caustic properties, great care must be taken that it is not administered internally in mistake for some other medicine. Few years pass without several fatal cases of this kind being recorded. *Oxide of zinc* is characterized in the pharmacopœia as "a soft, white, tasteless, and inodorous powder, becoming pale yellow when heated, and forming with diluted sulphuric acid a solution which gives a white precipitate with hydrosulphide of ammonia." It is employed internally with much success as a tonic in chorea and epilepsy, in which it must be given for a considerable period, and in gradually increasing doses till a scruple is taken daily. In doses of one or two grains combined with extract of henbane, it forms an admirable night-pill to check the perspiration in pulmonary consumption. Employed externally, either in the form of powder or ointment it forms a good astringent in cases of excoriation, sore nipples, intertrigo, slight ulcerations, etc. The official ointment containing 80 grains to an ounce of simple ointment is too strong for ordinary cases, and is apt to *cake* upon the surface: these defects may, however, be removed by the addition of glycerine. *Sulphate of zinc* is employed as an astringent, a

caustic, an emetic, and a tonic. As an astringent, it is given internally in small doses (of from half a grain to two grains, made into a pill with conserve of roses), in cases of chronic diarrhoea, chronic bronchitis, and long-standing leucorrhœa; while it is used topically as a lotion in old ulcers (from 5 to 20 grains to an ounce of water), as a collyrium in chronic ophthalmia, and as an injection in the abortive treatment of gonorrhœa (i.e., when we wish to cut short the disease before inflammatory symptoms appear). As a caustic, this salt, in its anhydrous state, and finely levigated, was strongly recommended by the late sir James Simpson. He applied it in the form of powder; of a paste made with glycerine in the proportion of a dram of the latter to an ounce of the powder; or of an ointment consisting of two drams of prepared lard, rubbed up with an ounce of the powder. It has also been successfully used in the Dublin hospitals. Sulphate of zinc may be given in the same doses as the oxide as a tonic in cases of nervous palsy, and in the exhaustion dependent upon sexual excesses. In large doses, as from 15 to 30 grains, it operates as a safe and speedy emetic, and is preferable to all other emetics in cases of poisoning. In toxicological researches—as in *Marsh's Test for Arsenic*—great care must be taken to see that the zinc which is employed is perfectly free from arsenic, which is a not uncommon impurity.

ZINCOGRAPHY is essentially the same art as lithography (q.v.), zinc-plates being substituted for those of stone. One form of the art is described under the name of Anastatic printing (see PRINTING). A style of it, called panceiconography, brought forward by Gillot of Paris, for the purpose of reproducing, by lithographic, autographic, or typographic proof, any drawing with crayon or stump, or any engraving from wood or copper, is thus described: A plate of zinc finely polished is prepared, and if an original drawing is to be copied, it is done by the artist in lithographic crayon on this plate; autographic writing done with the crayon, lithographs, and fresh proofs of wood or copper-plate engravings, must be transferred in the usual way to the surface of the plate; and while still wet, an ink-roller is passed over, so as to give a deeper impression. Rosin very finely powdered is then sifted over, which adheres to the wet ink, and becomes consolidated, so that the superfluous powder is easily brushed off from the parts not covered with ink. The plate is next placed with its face upward in a shallow trough containing dilute sulphuric or hydrochloric acid sufficient to slightly cover it; the trough is then gently rocked, so as to make the acid flow backward and forward over the plate, and if this be continued for some time—an hour or upward—all the parts of the plate not covered with the ink and rosin are etched deep enough to be used as a relief-plate for printing from. In impressions where there are large interspaces, it is usual to saw them out; and in some cases, where it is found that the relief is not sufficiently high, the raised parts are re-inked, and again covered with the rosin, and submitted a second time to the action of the acid. Old engravings may be transferred by laying them to become damp on a board wetted with acidulated water, and then applying the ink-roller to the face of the engraving: the ink only acts upon the ink-lines of the engraving, and is repelled by the acid moisture which has been imbibed by the uncovered white spaces. A slight pressure will then easily produce a copy on the polished zinc-plate, which is perfected by the subsequent operations.

ZINGARELLI, NICOLÒ, 1752–1837; b. Naples; studied music at the Naples conservatory. He became chapel-master at the Milan cathedral in 1792, and at St. Peter's in 1804. Dismissed from the latter post on account of his refusal to produce a *Te Deum* in honor of the birth of the king of Rome, he was soon appointed director of the music school of San Sebastian at Naples; and in 1816 he became again chapel-master of Milan cathedral. He wrote some 40 operas and much church music.

ZINGEL, *Aspro*, a genus of fishes of the perch family, remarkable for the elongated form of the body, and for having the mouth situated under the projecting and rounded snout, also for the roughness of their scales. The dorsal fins are widely separated, and the ventral fins are large. Only two species are known: of which one, the zingel of the Danube (*A. zingel*), inhabits that river and its tributaries, attains a length of 15 in., and a weight of two or three pounds; the other (*A. vulgaris*) is found in the Rhone and its tributaries, and also in more eastern rivers, although unknown in those of the w. of France, and is only 6 or 7 in. long. Both are esteemed for the table.

ZINGIBERA CÆÆ. See SCITAMINEÆ.

ZINNIA, a genus of plants named after a German botanist, J. G. Zinn. They belong to the order *composite*, and there are about 12 species, indigenous to Mexico and the southern portions of our western territory. They are chiefly annuals, with opposite, sessile, entire leaves. There are numerous branches, each terminated by a single head of flowers. The best-known species is *Z. elegans*, with its different-tinted flowers (a variety being double), which has long been known as a garden flower. Other species sometimes cultivated are *Z. multiflora*, with red-purple rays, and *Z. angustifolia*, with a double variety, *Z. haageana*, having showy orange colored flowers. All these plants are easily raised from the seeds in gardens in the United States.

ZINZENDORF, NICOLAUS LUDWIG, Count von, the founder of the existing sect of the Moravian brethren, or Herrnhuters, was b. at Dresden, May 26, 1700. His father, a Saxon state minister, dying while Zinzendorf was a child, the latter was educated by

his grandmother, a learned and pious lady, the baroness von Gersdorf. Spencer, the head of the Pietists, was a frequent visitor at her house, and his conversation, and the devotional exercises in which Zinzendorf took part, influenced his character while a mere child. In 1710 he went to Halle, where he spent six years, under the special care of Francke, the philanthropist. Zinzendorf founded among his fellow-pupils a religious society, to which he gave the name of the "order of the grain of mustard-seed." In 1716 he was sent by his relatives to Wittenberg, where Pietism was in less repute than at Halle; but he adhered to his early religious impressions. Two years afterward he traveled through Holland and France, everywhere endeavoring to convert the distinguished persons whom he met to his own religious views. On his return to Dresden, he was appointed a member of the Saxon state council, and married the sister of the count Reuss von Ebersdorf. But political life was little to his mind, and he returned to his country-seat in upper Lusatia. While residing there, he accidentally met a wandering carpenter, named Christian David, a member of the old sect of Moravian brethren, of whom some still remained in Moravia, professing the doctrines taught by John Huss. David described the persecutions to which the sect were exposed; and Zinzendorf invited him and his friends to settle on his estate. They accepted the proposal, and the colony received the name of "Herrnhut." Zinzendorf acted with great liberality to the settlers, and their success attracted much attention. In 1734 Zinzendorf went under a feigned name to Stralsund to pass an examination in theology, and was ordained a minister of the Lutheran church. In 1736 he was banished from Saxony, on a charge of introducing dangerous novelties in religion. He repaired to Holland, where he founded a Moravian colony, and afterward to Esthonia and Livonia, where he also founded colonies. In 1737, at the request of king Frederick-William I. of Prussia, he was ordained bishop of the Moravians. In the same year he went to London, where he was received with much consideration by Wesley. In 1741 he went to North America, accompanied by his daughter, and founded the celebrated Moravian colony at Bethlehem. The Herrnhuters, in the meanwhile, by their good conduct and industry, had won the respect of all classes in Saxony, and in 1747 Zinzendorf was allowed to return to Herrnhut. Having received authority by act of parliament to establish Moravian settlements in the English colonies of North America, he returned thither to do so. He finally settled at Herrnhut; and, his first wife being dead, married Anne Nitschmann, one of the earliest colonists from Moravia. He died on May 9, 1760. Thirty-two preachers, from all parts of the globe, accompanied the coffin to the grave. Zinzendorf was the author of more than 100 works in verse and prose. His hymns, used in worship by the Moravians, are objectionable on account of their pious indecency. The same may be said of his sermons, especially of those which refer to the Holy Ghost as a spiritual mother. His writings are often incoherent or mystical, but they abound with passages in which deep and original thought is expressed with great clearness and beauty.—There are lives of Zinzendorf by Spangenberg (1775), Varnhagen von Ense (in his *Biographische Denkmale*, 1830), and Burkhart (1876).

ZION. Mount Zion is the name of the hill on which the s.w. part of Jerusalem, the city of David, or upper city, with the citadel of David, stood. At the present day only the n. half belongs to the city, the city wall running obliquely over the hill. On the w., and still more on the s. side, it descends steeply into the vale of Hinnom, to a depth of 300 feet. Mount Zion is 2,537 ft. above the level of the Mediterranean sea. With the prophets and poets of the Old Testament, Zion often stands for the whole of Jerusalem (also called "Daughter of Zion"), particularly in reference to the temple. See JERUSALEM.

ZIPES, a co. in n. Hungary, bordering on Galicia, Sáros, Torna, and other counties; 1,404 sq.m., pop. '70, 175,061, of which the greater part were Germans and Slovaks. The surface is rugged, being traversed by a high range of the Carpathian mountains, and heavily wooded. The soil is not very fertile. Capital, Leutschau.

ZIRCONIUM (symb. zr, equiv. 44.8—new sys. 89.6) is the metallic constituent of the earth, *zirconia*, which is found in association with silica in the minerals *zircon* and *hyacinth*. The composition of zirconia is usually represented by the formula Zr_2O_3 , but Swanberg regards zirconia not as a pure earth, but as a mixture of three; and to one of the metals, whose earths he thinks that he has isolated, he gives the name of *norium*. The sources from which zirconium is derived are so few (it being found only in Ceylon, one district of Ural, and Southern Norway), that it is unnecessary to enter into any details regarding it.

ZIRKNITZ, or CZIRKNITZ, LAKE (Ger. *czirknitzersee*, *lacus lugeus* of Strabo), a small lake of Austria, in Carniola, about 20 m. s.s.w. of Laibach, and 30 m. e.n.e. of Trieste, is situated in a deep valley to the s. of Mt. Javornik, and to the n.e. of Mt. Slivizza. The lake is about 5 m. long, and between 2 and 3 broad, is surrounded with numerous villages, chapels, and castles, contains four small islands—on the largest of which is built the hamlet of Ottok—and has no surface outlet. It is about 56 ft. deep in the deepest part, and is very irregular in shape. It is worthy of notice only on account of the very remarkable phenomenon of the occasional disappearance of its waters for several weeks, and even months, during which the bottom is often covered with luxuriant herbage, which the peasants make into hay; sometimes also they manage even to sow and reap a

small crop of buckwheat in its deserted bed. The waters, however, are not perfectly regular in their disappearance—indeed, sometimes for five or six years together they have not retired at all—but generally they drain off in the end of August, and return, if the season be wet, in five or six weeks. It takes between 20 and 25 days to empty the lake, but the return of the waters is sudden and unexpected, its basin being refilled sometimes in 24 hours. The phenomenon is accounted for by the nature of the bed of the lake. It is composed of limestone, and, like all the Carniolate plateau, is full of deep fissures and caverns, through which the waters disappear at irregular intervals, returning when the rain sets in. Some of these openings are 50 ft. deep, and the chief ones are known to the peasantry by particular names. They communicate with subterranean reservoirs, penetrating the interior of the surrounding mountains, through which the waters are replenished or drawn off. There are 12 of these openings which discharge water into the lake as well as draw it off, and 28 which draw it off only. Through the former of these the water pours in after rainy weather as from a spout. When the surface of the lake reaches the caverns of Velka-Karlauza and Malka-Karlauza, the waters are discharged by these into the valley of St. Canzian, and after disappearing several times, fall into the Unz, above Planina. Sometimes, however, the volume of water is so great that these caverns prove insufficient to carry it off, when the lake overflows and covers the neighboring country, sometimes submerging villages. In 1834, the lake was drained in January, and remained perfectly dry till the end of February, 1835, a circumstance without parallel since the time that any records of its history have been kept. The lake is pretty well stocked with fish, and at certain times is the resort of great numbers of waterfowl, which afford both sport and profit.—There is a small village of the same name on a small stream that falls into the n. side of the lake.

ZISKA,* or **ZIZKA**, JOHN, of Trocznov, the famous leader of the Hussites, was b. at Trocznov, in the circle of Budweis, Bohemia, about 1360. His family being noble, he became a page to king Wenceslas of Bohemia, but his gloomy and thoughtful temperament unfitted him, while yet a mere boy, for the frivolous occupations about court; so, embracing the career of arms, he served as a volunteer in the English army in France, and afterward joined king Ladislas of Poland with a body of Bohemian and Moravian auxiliaries, and greatly distinguished himself in the war against the Teutonic knights, deciding the dreadful battle of Tannenberg (in which the grand master and 40,000 knights were left dead on the field) by desperate charges at the head of his contingent. High honors were heaped upon him by the king; but the war (in which Ziska had lost his right eye) being now over, his restless spirit led him to join the Austrians against the Turks, and subsequently the English against the French; and returning to Bohemia soon after the murder of John Huss (q.v.), he became chamberlain to king Wenceslas. Ziska was an adherent of the Hussite doctrine; and the tragical fate of its apostles, and the tyrannical cruelties exercised by the imperial and papal officers on its adherents, excited in his mind the liveliest indignation and resentment. A widespread sentiment of a similar kind, originating as much from patriotic as from religious feelings, existed in the kingdom; and a powerful party was soon formed, which urged upon the king a policy of resistance to the decisions of the council of Constance. Ziska soon became prominent among the leaders of this party, and his personal influence with the king gained for it the latter's sanction to offer resistance, though the king's vacillating disposition incapacitated him from giving effect to his own honest convictions and taking open part with his subjects against their oppressors. After the outbreak at Prague (July 30, 1419), in which the violent behavior of the Catholics was avenged by the precipitation of 13 magistrates from the council windows, Ziska was unanimously chosen leader of the Hussites, and the first great religious conflict of Germany was commenced in earnest. The shock produced by news of this outbreak was fatal to Wenceslas, and his death gave more of a political character to the contest, as when his brother, the emperor Sigismund (the same who had allowed his safe-conduct to Huss to be violated), attempted by advancing an army of 40,000 men into the country to obtain the throne, his project was frustrated for a time by the Hussites, who insisted on their religious and political liberties being secured, and totally defeated his army with a hastily levied force of not more than 4,000. On the retirement of the imperialists, Ziska completed his conquest of Bohemia by the capture of the castle of Prague in 1421 (the town had been taken in the spring of 1420), and secured his hold of the country by the erection of fortresses, chief of which was that of Tabor, whence his party derived its name of *Taborites* (q.v.). The varied experience acquired by Ziska in foreign warfare was now of immense service to his party; his followers were armed with small fire-arms (then little known); and his almost total deficiency in cavalry was compensated for by the introduction of the *wagenburg* (or "cart-fort," constructed of the baggage-wagons), to protect his little army from the charges of the mail-clad knights. Numerous other inventions and ingenious contrivances mark Ziska's brief career as leader of the Hussites, and show his eminent qualities as an engineer and a general. In 1421, he lost his remaining eye at the siege of the castle of Rabi; but though now totally blind, he continued to lead on his troops to a

* It is often stated that John of Trocznov was called Ziska on account of his being "one-eyed," but this is erroneous; Ziska was the name of the family for generations before his time, nor does it signify "one-eyed" in either the Bohemian or the Polish language.

succession of victories almost unexampled in history—the list of 13 pitched battles fought by him, always with much inferior force, including only one defeat, and that so much resembling a drawn battle, that his opponents dared not molest his retreat. His greatest achievements were the rout (Jan. 18, 1422) of Sigismund's second invading army, which was driven into Moravia, and 2,000 men of it drowned in attempting to escape across the frozen Iglau; and his great victory at Aussig, over the German crusading army, commanded by Frederick the warlike of Saxony, and the elector of Brandenburg. In the latter conflict, the furious onset of Ziska's troops was steadily sustained by the Saxons, who were choice troops, and the fanatic Hussites recoiled in astonishment at a successful resistance which they had never before encountered. Ziska, apprised of the circumstances, approached on his cart, thanked his men for their past services, adding, "and if you have now done your utmost, let us retire." Thus stimulated, they made a second charge still more furious than before, broke the Saxon army, and left 9,000 of it dead on the field. Sigismund was now convinced that the conquest of Bohemia was impossible, and after a time proposed an arrangement with the Hussites, by which full religious liberty was allowed; and Ziska, who had an interview with the emperor on the footing of an independent chief, was to be appointed governor of Bohemia and her dependencies. But the war-worn old chief did not live long enough to complete the treaty, for, while besieging the castle of Przbislav, he was seized with the plague, and died Oct. 12, 1424. He was buried in a church at Czaslav, and his iron war-club was hung up over his tomb. A foolish story was long current that, in accordance with Ziska's express injunctions, his skin was flayed off, tanned, and used as a cover for a drum, which was afterward employed in the Hussite army; in order that even when dead he might be a terror to his enemies.

The only accusation which can with justice be made against Ziska is on the ground of excessive cruelty, the victims being the monks and priests who fell into his hands. But atrocious cruelties were practiced on the Hussites, and it was not to be expected that the weaker party should set an example of moderation.

ZITHER, the cithern, the modern representative of the ancient *cithara*, is a popular and common instrument in Tyrol, and of late years has become more widely known. It is a flat stringed instrument, having a wooden frame and flat sounding-board, with brass strings. When to be used it is placed on a table or on the knees, and the strings are played by the right hand, the thumb being armed with a metallic *plectrum* to bring out the melody more prominently. Latterly a good deal of music has been composed expressly for the zither, the tone of which is clear, keen, but melodious.

ZIT'TAU, a t. of Saxony, 48 m. e.s.e. of Dresden, and 69 by railway, is situated near the Bohemian frontier. The town has many churches, the most notable of which is the Byzantine church of St. John, finished in 1836; a splendid court-house, one of the finest in Saxony, erected 1844; a good library of 12,000 vols.; a gymnasium, a normal, a free, an industrial, a Catholic, an infant, and other schools; several charitable institutions—as a work-house, infirmary, asylum for orphans, etc. Zittau is the center of the linen and damask manufacture of Saxony. There are also woollen manufactures, bleach-fields, dye-works, paper, oil, and saw mills, and iron-foundries. Its position on the railway into Bohemia led the Prussians to make it a center of operations during the war of 1866. Pop. '75, 20,417.

ZLATOUST', or **KLITCHI** (Golden Mouth), a t. of Russia, in the government of Orenburg, among the Ural mountains, about 150 m. n.e. of Ufa, on the river Ufa. It consists chiefly of wooden houses, and the inhabitants are mostly miners. It is the center of the iron and gold mines of the district. There is an extensive manufactory of sword blades, which are considered the best in the empire; other articles of inlaid and embossed steel are also manufactured. Pop. 15,000.

ZMEINOGORSK, or **ZMIEF**, a t. of Siberia, in a mountainous district of the government of Tomsk, upward of 350 m. s.w. of the town of Tomsk, on the river Smievka. The town is situated in the vicinity of one of the most productive silver-mines in Siberia, which was discovered in 1736, and belonged to the Demidoff family till 1745, when it became crown property. Since its discovery it has yielded nearly a half of all the silver produced by the Siberian mines. Pop. 5,990.

ZNAIM, or **ZNAYM**, a t. of the Austrian empire, in Moravia, on a rising ground close to the left bank of the Taja, 48 m. n. by w. from Vienna. It is celebrated for the conflict which took place here between the French and Austrians, on June 14, 1809, in which the French were victorious (see **WAGRAM**). A castle on the height, the ancient residence of the princess of Moravia, is now a military hospital. Near it is a circular church, supposed to be as old as the 12th century. Pop. '69, 10,600.

ZOAN, one of the oldest cities of Egypt, on the eastern side of the Tanitic branch of the Nile. It was once the residence of the Pharaohs, and, in the psalms, the field around it is described as the scene of God's marvelous works in the time of Moses. The destruction which Ezekiel foretold long since came upon it. The "field" is a barren waste. The royal city is a habitation of fishermen, and a resort of wild beasts and reptiles. The surrounding space, for nearly a mile square, is covered with mounds of great height and full of broken pottery. The area, within which the sacred inclosure

of the temple stood, is about 1500 ft. by 1250, surrounded with the mounds of fallen houses raised above it by successive elevations. There is a stone gateway to the inclosure which bears the name of *Rameses the great*. Even in their ruinous condition the broken walls, columns, and 10 or 12 fallen obelisks attest the ancient splendor of the building to which they belonged; and with them are joined two black statues and a granite sphinx. The obelisks are all of the time of *Rameses*, 1355 B.C., and his name most frequently occurs; but the ovals of *Osirtasen III.*, and of other kings also, have been found: and as his time goes back nearly to that of *Joseph*, the scriptural account of the antiquity of the city is confirmed. The wretched village *San* keeps barely alive the Arabic version of the name.

ZOAR, a village in Ohio, on the Ohio canal, 90 m. e.n.e. of Columbus, settled in 1817 by a German community, "The Society of Separatists of Zoar," who hold in common 9,000 acres of land; they have a woolen factory, mills, a store, church, school, and other social and industrial establishments, all managed by trustees elected by popular vote. Pop. '70, 326.

ZOAR, one of the most ancient cities of Palestine, originally called *Bela* or *Bala*. It was one of the five cities of the plain of Jordan, and though doomed with the others to destruction, it was spared, at *Lot's* intercession, to afford him a refuge. In the account of the death of *Moses* it is mentioned as visible from *Pisgah*, and it was known in the time of *Isaiah* and *Jeremiah*, as appears from allusions to it in their prophecies. Its exact location is unknown. It was certainly in the vicinity of the other four cities—viz., in the "plain" or "circle" of the Jordan—and the narrative implies that it was near *Sodom*. As the plain of Jordan was on the n. side of the Dead sea, these cities must have been there instead of at the southern end of the lake as is commonly supposed. *Eusebius* and *Jerome* describe Zoar as having many inhabitants and a Roman garrison in their day. *Stephen of Byzantium* calls it a large village and fortress. It is spoken of as the seat of a bishop. The crusaders found it under the name *Segor*, and describe it as pleasantly situated and having many palm-trees. *Abulfeda* frequently mentions *Zoghlar* as a place adjacent to the Dead sea.

ZO'BO, a hybrid between the yak (q.v.) and the common ox of India. It is not very unlike an English ox. It is common in the western parts of the Himalaya, and is valued as a beast of burden, as well as for its milk and its flesh.

ZO'CLE, or **SOCLE**, a square plain plinth under the base of a column.

ZO'DIAC (Gr. *zōdiakos*, commonly derived from *zōōn*, an animal), the name given by the ancients to an imaginary band extending round the celestial sphere, having as its mesial line the ecliptic or apparent path of the sun. It was fixed at about 16° in width, for the purpose of comprehending the paths of the sun and of the five planets (*Mercury*, *Venus*, *Mars*, *Jupiter*, and *Saturn*) which were then known; and as, of these planets, *Mercury* has by far the greatest inclination of orbit to the ecliptic, and the value of that element in his case is only 7° 0' 9", the width given to the zodiac was amply sufficient for the required purpose. But when the career of planetary discovery commenced in the beginning of the 19th c., the first three which were discovered (*Ceres*, *Pallas*, and *Juno*) at once destroyed the idea which had been long seated in men's minds, that no planets existed beyond the limits of the zodiac, by exhibiting orbits inclined to the ecliptic at no less angles than 10° 36½', 34° 42½', and 13° 31½'; and a large number since observed have been found to wander from 0° to 18° beyond the zodiac, from which circumstance they have, along with the three above mentioned, been denominated *ultra-zodiacal* planets. The stars in the zodiac were grouped into 12 constellations, to each of which 30°, or ¼th of the whole circle, was assigned, though it often did not fill up that space, but was only situated in it; and this equable division into *signs* was of great advantage in defining the positions of the sun and planets at any epoch.

The constellations, with the appropriate symbols of the corresponding signs, are as follow:

Aries (*Ram*) ♈
Taurus (*Bull*) ♉
Gemini (*Twins*) ♊
Cancer (*Crab*) ♋
Leo (*Lion*) ♌
Virgo (*Virgin*) ♍

Libra (*Balance*) ♎
Scorpio (*Scorpion*) ♏
Sagittarius (*Archer*) ♐
Capricornus (*Goat*) ♑
Aquarius (*Water-bearer*) ♒
Pisces (*Fishes*) ♓

As one half of the ecliptic is to the n., and the other to the s. of the equator, the line of intersection of their planes is a diameter of each, and the two points in which this line meets the celestial sphere are known as the equinoctial points. The comparative immobility, with respect to the ecliptic, of these points, suggested at once the employment of one or other of them as a point from which to reckon, and accordingly that point at which the sun crosses the equinoctial from s. to n. was fixed upon, and called the first point (or commencement) of Aries. After the sun had advanced eastward through this sign—i.e., 30° along the ecliptic—he entered the sign of Taurus, continuing his course onward through the others in the order in which they are given above, again crossing the equinoctial southwards at the point where he emerged from Virgo

and entered Libra. This was the case with the sun during the time of Hipparchus (q.v.), but though the equinoctial points move very slowly, yet they do so with great uniformity, and the westerly motion of 50" annually which they describe along the ecliptic has at the present time separated the sign Aries from the constellation Aries, and caused the former to correspond almost to the constellation Pisces. This gradual retrogression of the signs through the constellations of the zodiac will continue till they accomplish, in about 25,868 years, a complete circuit; after which period the sign and constellation of Aries will coincide, as they did in the time of Hipparchus. Neither the zodiac nor its constellations are of much use now in astronomy, except as, like the other constellations, affording an easy though somewhat fantastic nomenclature for the stars, and a rude but sometimes convenient mode of reference to their positions.

The porticoes of the temples of Denderah and Esne in Egypt, have representations of the zodiacal constellations, which are of great antiquity, and have formed a fruitful theme of discussion. M. Dupuis, in his *Origine des Cultes*, has, from a careful investigation of the position of these signs, and calculating precession at its usual rate, arrived at the conclusion that the earliest of them dates from 4000 a.c. This conclusion is controverted by M. Fourier, in his *Recherches sur les Sciences etc. de l'Egypte*, who makes the representations at Esne 1800 years older than the other; but his hypothesis has been in turn overthrown by MM. Deler and Biot. The truth seems to be that nothing is as yet definitely known respecting these ancient representations; for the manner in which the investigations have been mixed up with the Biblical question of the antiquity of man, has prevented any truly scientific research. The Greeks would seem to have borrowed their constellations from the Egyptians and Babylonians, and this is corroborated to some extent by occasional remarks in Greek writers as to the positions of various constellations at certain times, which positions are inconsistent with the supposition of the observer being in Greece. The zodiacal figures of the Hindus, ancient Persians, Chinese, and Japanese have such a remarkable resemblance to those of the Egyptians, that there can be little doubt as to their common origin.

ZODIACAL LIGHT is the name given to a singular appearance seen after sunset or before sunrise, at all seasons of the year in low latitudes, but rarely in this country, except in March, April, and May in the evenings, and six months later in the mornings. It is obviously due to illuminated (partly, perhaps, self-luminous) matter surrounding the sun in a very flat, lenticular form, nearly coinciding with the plane of the ecliptic, or rather with the sun's equator, and extending to a distance from the sun greater than that of the earth, since its apex is often seen more than 90° from the sun. It seems to have been first distinctly pointed out by Cassini, and was long regarded as the sun's atmosphere. This idea, however, is totally irreconcilable with mechanical principles; since, to assume so flat a form, in spite of the enormous attraction of the sun, and its own elasticity, an atmosphere would have to revolve with a velocity so great as to dissipate it into space. The only conceivable explanation of the phenomenon is, therefore, to be found in supposing it to consist (like the rings of Saturn) of an immense assemblage of small cosmical masses, rocks, stones, and pieces of metal, such as are continually encountering the earth in the form of aerolites or meteorites. For the dynamical stability of such a system, it is only necessary that each fragment should separately describe its elliptic orbit about the sun. The mutual perturbations of the system, on account of the enormous mass of the sun, will be exceedingly small, except in the case of actual collision; but some of the planets will have a considerable effect upon it. That this is the true explanation of the phenomenon, is now generally believed. Some very curious recent observations on the August and November meteorites of 1866 (see METEORS) have shown that these bodies move in orbits almost exactly the same as those of two known comets. The comet, then, is merely that portion of the ring of small masses, revolving all nearly in the same orbit, where the greatest number are, for the time collected: and it is possible that to the collisions, which must most frequently occur where the separate particles are most numerous grouped, are due the spectral phenomena of incandescent gases which have been observed in the heads of comets by Huggins and others. Such speculations, were this the place to pursue them, might easily be extended to the sudden production and changes of form, of the tails of comets which occur near perihelion, for there the separate masses must necessarily be much more crowded together, and their impacts must be increased both in number and violence.

ZOETROPE, or **WHEEL OF LIFE**, an optical instrument, so named from its exhibiting pictures of objects as if endowed with life and activity. Although only of late years introduced from America, under this name, the instrument itself, which is simply a cylindrical thaumatrope, was invented and made the subject of a patent so long ago as the year 1860. Mr. Peter Hubert Desvignes, the inventor, in his published specification, has very fully described various modifications of the cylindrical thaumatrope; and the instruments which, under the name of mimoscope, he contributed to the London exhibition of 1862, being furnished with pictures of exquisite artistic finish and beauty, were deservedly rewarded with "honorable mention." Mr. Desvignes also proposed a stereoscopic form of the instrument, in anticipation of the one already described under stere-

oscope (q.v.), and has employed models, insects, and other objects, instead of pictures, with perfect success. The truly marvelous results shown in this instrument depend, primarily, on the well-known fact that vision "persists" for a certain short interval of time after the occlusion of the visual ray. It follows from this principle that if a series of pictures, representing the different attitudes successively assumed by an object in completing a given movement, be presented to the eye so quickly that the visual impression of each picture shall continue until the incidence of the one next following, the object will remain constantly in view, and its various parts will appear to execute the movement delineated by the pictures. The zoetrope in its most popular but by no means most excellent form consists of a cylinder of strong card-board, 12 in. in diameter, and $7\frac{1}{2}$ in. in depth, with a metal rim at the top, and fastened to a circular piece of wood. The latter is screwed at its center to a pivot, which moves freely within an upright of a stand, and forms a vertical axis, round which the cylinder may be made to revolve with any desired rapidity. There are 13 equidistant and vertical apertures, each $\frac{3}{16}$ in. in width, and 3 in. long. Each series of pictures is printed on a strip of thick paper, $3\frac{1}{2}$ in. in breadth, and 36 in. in length. In using the instrument, illuminate it well from above, and, having placed the picture-strip within the cylinder, immediately beneath the apertures, rotate the cylinder with the requisite velocity (which will vary according to the nature of the subject), and look through the apertures at the pictures upon the opposite side of the cylinder. To avoid the grotesqueness of a number of groups all seen performing the same movement at the same time, Mr. Desvignes devised the thaumatrope, in which the cylinder turns upon a horizontal axis, and by means of an aperture at the bottom of a hood the sight is limited to the space occupied by a single group on the opposite side of the cylinder, and, both eyes being brought into simultaneous activity, the clearness and pleasantness of the illusion are greatly enhanced. In this arrangement, the groups are arranged, on the strips, one above another, and not side by side, as in the former; and they are perforated with apertures to correspond with those on the cylinder. As has been pointed out by Mr. Desvignes, the width of the apertures should never exceed one-sixteenth of an inch; and the exterior of the instrument should be painted mat black.

We will now speak of the principles which determine the character and distinctness of the illusion, and first of all will endeavor to explain why it is that the pictures, looked at through the apertures, are plainly visible; whereas, viewed over the top of the revolving cylinder, they run into an indistinguishable mass.

The effect of the apertures, in this regard, is twofold, they limit the *time* during which each group is pictured upon the retina; and they limit, or should be made to limit, the *quantity* of each group at any one instant so depicted. Obviously, if the view be *instantaneous* only, the group in that minute interval of time will not have moved to a *perceptible* degree, and will therefore appear stationary. It is for this reason that the apertures should be made very narrow (not exceeding one-sixteenth of an inch, as above stated), and then, the eye being placed close to them, the retinal images will not be blurred—as with wider apertures, and consequent increased motion of the pictures while under view, they would be—and the maximum of *definition* is thus attained. But, in this case, both the quantity of light reaching the eye, and the time of its operation, are insufficient, which defects can only be compensated by setting the instrument in violent motion, thus occasioning an inconveniently rapid recurrence of the retinal impressions. Instead, therefore, of letting the whole picture be seen for a *single* instant, let us increase the total time of visibility by arranging that successive small portions of the pictures shall be seen in *successive* instants. This is effected by withdrawing the eye a few inches from the aperture; for the eye being at the apex of the visual angle, the further it is removed from the aperture, the greater is the distance *within the visual angle* through which the aperture must travel; and prolonged in a like degree will be the *total time of visibility* for each picture. But here another difficulty is evoked, manifesting itself in one of the most puzzling phenomena of this curious instrument. The pictures are seen as *sensibly diminished in breadth*, the explanation of which is as follows: The longer the time of visibility, the greater will be the onward movement of the picture while under view; therefore, if the left-hand side of the picture come first into view, by the time the advance of the aperture permits of the right-hand side being seen, the latter will have progressed *toward* the left, and it will accordingly be seen relatively nearer to the left side than is its natural position. And this compression, of course, takes effect over the whole of the picture. In the exquisitely elaborate drawings prepared by Mr. Desvignes, this compression was allowed for, to the great enhancement of the effect.

Lastly, of the effects due to the pictures themselves. If the pictures on the strip be the same in number as the apertures, the pictures will either coincide with the apertures, in point of position, or will be equidistant, each from its adjacent aperture; in which case there will be no apparent shifting of the pictures either to right or left. But if there be 12 pictures and 13 apertures, the picture-interval will be greater than the aperture-interval, and only one picture on the strip can be coincident with an aperture; the rest will be situated in advance of the apertures, each succeeding one slightly more than its predecessor; and, as a consequence, seen through the apertures of the revolving cylinder, they will appear continuously to advance. The contrary will be the case, if the number of the pictures exceed that of the apertures. These

curious properties, which make it possible to exhibit figures moving either backward or forward, as well as with movements proper to themselves, were fully investigated by the late prof. Faraday; and we would recommend those interested in the subject to refer to his memoir on optical deceptions, contained in his *Experimental Researches in Chemistry and Physics*, pp. 291, *et seq.*

ZOILUS, a grammarian, b. at Amphipolis. Authorities vary respecting the age in which he lived, and the manner of his death. The usual account is that he lived in the time of Ptolemy Philadelphus, and that he solicited, but without success, the patronage of that monarch. He gained notoriety for the bitterness with which he attacked Homer, whence he was surnamed *Homeromastix*, Homer's scourge. His name is used proverbially for an austere and malignant critic, as Aristarchus is for one candid and intelligent. All his works are lost.

ZOLLVEREIN (Ger., meaning "customs-union"), a union of different independent German states, under the leadership of Prussia, so as to enable them, in their commercial relations with other countries, to act as one state. When, after the war of liberation in 1815, the political union, destroyed by the downfall of "the holy Roman empire," had been restored to a certain degree in the German "bund" (see GERMANY), internal commerce was felt to be trammelled and depressed by the collection of revenue at the frontiers of every petty state; nor was it possible, without united action, to carry out the policy in regard to foreign commerce which might be thought best for protecting and developing the native trade and manufactures. The first suggestion of such a union came from Prussia; but it took many years before an actual beginning was made, and still longer before it reached its ultimate extent, as the plan was opposed for a long time by the jealousies and special interests of many of the states.

From 1819 to 1828, only some of the minor principalities inclosed within the Prussian territories had been got to conform to the Prussian commercial system; but in 1828, Hesse-Darmstadt, and in 1831, Hesse-Cassel, gave in. This was followed, in 1833, by the accession of Bavaria, Würtemberg, the kingdom of Saxony, the principality of the same name, Schwarzburg, and Reuss; and in 1835-36, by that of Baden, Nassau, and Frankfort-on-the-Main. The adhesion of Hanover did not take place till 1851, of Oldenburg till 1852. When in 1868 Lübeck and the two duchies of Mecklenburg had joined the Zollverein, its territory extended over the whole of what subsequently became the German empire, with the exception of Hamburg, Bremen, and a small part of Baden near Schaffhausen. The reichsland of Alsace-Lorraine was incorporated in 1871. The imperial constitution of April 16, 1871, recognizes and ratifies the privilege of the free ports so to remain until "they themselves demand admittance within the common customs-boundary."

The principle of the Zollverein's action was this: The whole territory embraced by the union formed commercially (in regard, at least, to countries beyond its limits) one state. The duties on exports, imports, and through transports were collected at all the frontiers of the union according to a uniform tariff (subject to some concessions, made on special grounds, to individual states); and the proceeds, after paying the expenses of collection, were divided among the members of the union in proportion to their several populations. In regard to the internal trade of the union, as the duties on articles manufactured for home consumption were different in the different states, a complicated system of drawbacks came into play, in order to put the commerce of all on an equal footing.

The treaty of union was agreed upon for a definite period of years, and was renewed from time to time; as in 1842, 1853, 1865, 1867. In the latter year much was done to simplify the relations of the various states to one another in respect of internal trade; and the administration of the Zollverein was so modified as to give to the various members of the union votes in its council and parliament proportionate to the number of inhabitants in each state.

Since the establishment of the German empire, the Zollverein has no longer a separate constitution of its own. Its council (representing governments) is merged in the federal council of the empire; its parliament (representing populations) in the reichstag. Affairs are managed on the principles adopted by the Zollverein in 1867, by permanent committees of the federal council—viz., those for customs and taxes, for trade and commerce, and for finance.

The net income of the Zollverein, which, in 1834, amounted only to 12,178,761 thalers, had risen in 1871, the last year in which the Zollverein had separate accounts, to 28,000,002 thalers (above £4,000,000).

ZOLYOM, a co. in n.w. Hungary, drained by the Gran, Szalutia, and other rivers; about 1050 sq.m.; pop. '70, 101,958. The surface is uneven. The climate is cold. Cattle are largely produced. Gold, silver, iron, copper, and coal, abound. The chief export is cheese. There are some manufactures. Capital, Neusohl.

ZOMBOR, a royal free t. of Hungary, on a plain about 120 m. s. of Pesth, capital of the district of Bacs, near the Francis canal. It has handsome county buildings, Greek and Roman Catholic churches, gymnasium, barracks, town-houses, etc. There is a brisk trade in grain and cattle. Pop. '69, 24,309.

ZONES (lat. *zona*, a girdle), portions of the earth's or of a planet's surface, chiefly in form of belts or girdles, divided by parallels of latitude which are defined by the inclination of the plane of the planet's equator to that of its orbit, or ecliptic. The plane of the earth's equator is inclined to that of its orbit, $23\frac{1}{2}^{\circ}$, and when the planet is at the summer solstice (21st of June), the sun's rays fall perpendicularly upon that parallel of latitude (the tropic of Cancer), which is $23\frac{1}{2}^{\circ}$ n. of the equator. Conversely, at the winter solstice (22d of Dec.), the sun's rays fall perpendicularly upon that parallel called the tropic of Capricorn, which is $23\frac{1}{2}^{\circ}$ s. of the equator. The belt thus defined, lying between the tropics, and having a breadth of 47° ($23\frac{1}{2} \times 2$), is called the torrid zone. Now, when the sun's rays are vertical to the tropics, and the sun always pours his vertical rays over some portion of it, they will be tangent to certain parallels (polar circles) lying $23\frac{1}{2}^{\circ}$ from the poles, throwing that portion of the earth's surface bounded by one of these circles into shadow, and continually shining upon that portion bounded by the other. These circles define the boundaries of the frigid or polar zones. Lying between these and the torrid zone there are, therefore, two belts (one in each hemisphere) bounded by the tropics and the polar circles, each 43° in breadth, called respectively the n. temperate and s. temperate zone. Over some portion of their surfaces the sun always shines, but never vertically. The zones, therefore, are not bounded by arbitrary but by natural fixed lines, although in the ordinary, non-geometrical sense, they are imaginary. Connected with these natural divisions of the earth's surface are the phenomena of the seasons and climate, and of length of day and night. See **SOLSTICE**, **SEASONS**, and **CLIMATE**. Let us consider here the zones of a planet whose equatorial inclination is much less than the earth's. The inclination of the plane of Jupiter's equator to that of his orbit is only 3° ; consequently, the tropics defining the torrid zone, that belt is only 6° wide, and the frigid zones each the same, while the temperate zones are each 84° in breadth. This condition is theoretical. Practically, if Jupiter received most of its present heat from the sun, as the earth does, and had real seasons, and supported life, there would be a series of sub-torrid and also of sub-frigid zones lying on either side of the really temperate zones. The length of day and night varies but little on Jupiter except near the poles, at which points the days and nights are alternately six of our years long, the planet making its revolution round the sun in twelve of our years, but the nights cannot be dark. The seasons, if there were any practically, would vary but little in one latitude. There would be continual summer within, and to a considerable distance beyond the tropics; continual spring further beyond, and still further continual winter.

ZONT'RIDÆ, a family of saurian reptiles, having the head covered with regular polygonal shields, the body and tail with large scales; the sides furnished with a longitudinal fold of the skin, covered with small scales; the tongue flat, nicked at the tip, the eyes with two valvular lids. The species are numerous, natives of warm climates. The form of some is rather short and thick, others are long and serpent-like. In some also, the limbs are well developed, in others they are merely rudimental, and in some the very rudiments of them are entirely concealed under the skin.

ZOOLOGY (Gr. *zōon*, an animal, and *logos*, a discourse), the science which has for its subject the animal kingdom (q.v.). This science, itself a branch of natural history (q.v.), is divided into a number of branches, which are often pursued as distinct sciences, the subject being too large to be thoroughly studied except in this manner; although it is also necessary that the results of investigation in particular departments should be brought together, so that the animal kingdom may be viewed as a whole, and the relations of the most widely different groups of animals to each other determined. The number of species of animals is far greater than that of plants, and the diversity among them is also greater, so that a division of the science of zoology into branches relating to different groups very naturally takes place. Thus, the branch of zoology which has the *mammalia* for its subject has been called *mazology* (Gr. *mazon*, a tent), an unhappily chosen and essentially incorrect term, which has not come into general use; and it is a curious circumstance that this, which may be call the highest branch of zoology, has no popularly received name. It is otherwise with the branches of zoology relating to the inferior classes of *vertebrata*; that which has *birds* for its subject is universally known as *ornithology* (q.v.); that which relates to *reptiles* is *herpetology* (q.v.), and the subordinate branch relating to serpents is sometimes called *ophiology*; that which relates to *fishes* is *ichthyology* (q.v.). Among *invertebrate animals* the great group of *mollusca* is the subject of the science of *malacology* (q.v.), although this term is not in such general use as some of those already mentioned; and when shells rather than the animals which bear them are considered, the term *conchology* (q.v.) is employed. No particular term is commonly applied to the branches of zoology which treat of the *crustacea*, *arachnida*, etc.; but that which relates to *insects* is universally known as *entomology* (q.v.), and the term *helminthology* (q.v.) is employed to designate that which has *worms* for its subject. No similar terms are used for the branches of this science which relate to other groups of *invertebrata*.

The science of zoology, however, divides itself into distinct sciences, not only in accordance with the divisions of the animal kingdom, but also with regard to particular branches of the subject which may be studied either in relation to animals generally or to any particular species. Thus, *anatomy* (q.v.) may be regarded as a branch of zoology,

when the term zoology is taken in its largest sense, as including man along with the inferior animals, and *ethnology* (q.v.) must in like manner be considered as belonging to it. The anatomy of the inferior animals is sometimes called *zootomy*, and the term *comparative anatomy* is employed when their structure is studied in relation to that of man, and the structure of one division of the animal kingdom in relation to that of the others. *Physiology* (q.v.) is one of the most important branches of zoology; and with it that branch of chemistry which treats of animal substances is closely connected. A very interesting branch of zoology is that which relates to the habits and instincts of animals. It can hardly be said to have been constituted into a separate science, but has received much attention from those naturalists who have devoted themselves to the study of particular groups of animals.

We have no evidence that the study of zoology was prosecuted to any considerable extent before the time of Aristotle. In his hands it became at once a science, and the foundations of a system of classification were laid. No artificial system of classification has ever been proposed in zoology, like the sexual system of Linnæus in botany; but from the very first to the present day a natural grouping of animals has always been attempted. To this the widely marked distinctions between the principal groups almost unavoidably led. Aristotle brought to bear upon the subject the highest powers both of observation and of generalization, and some of the groups established by him still retain their place in the most modern systems. Aristotle divided the whole animal kingdom into two great sections, the highest, *enaima*, consisting of animals having blood (i.e., red blood), and the lower, *anaima*, of animals having a colorless fluid instead of blood, the former corresponding to the *vertebrata* and the latter to the *invertebrata* of modern zoologists.

No other ancient writer deserves much notice in a historic sketch of zoology. Ælian and Pliny show no capacity for the scientific treatment of the subject, and in their writings facts are largely mingled with fables. During the middle ages zoology, like other kindred sciences, was almost completely neglected. For many centuries, the only name worth mentioning, in connection with the history of the science, is that of Albert, count of Bollstädt, commonly called Albertus Magnus; whose knowledge, however, was entirely derived from Aristotle and other ancient authors, and all he did was merely to call attention to the forgotten science, without making any contribution to its advancement. From his time, in the first half of the 13th c., to the beginning of the 16th, zoology was again almost completely neglected; but the new activity of mind which then displayed itself soon sought this as well as other directions, and an impulse was more especially given to zoology as well as to some other branches of science, by the progress of geographical discovery; curiosity being awakened with regard to the strange productions of the new world, and of the eastern and southern regions till then equally unknown. The names of Belon (q.v.) and Rondelet are the two greatest in this department at this period, and by them zoology was enriched with many new facts, while attempts were also made at a more perfect classification. Aldrovandi and Gesner (q.v.) soon followed them, besides others who began to direct their attention more specially to particular branches of zoology, some of whom greatly extended the science by their observations on the animals of newly discovered countries. It was not till after the middle of the 17th c., however, that any real progress was made in classification, founded upon a philosophical study and comparison of animals. The works of Ray (q.v.) are described by Cuvier as "the foundation of modern zoology." The materials, however, were in great part prepared, and the first outline of a system sketched by Willoughby, the friend of Ray, whom Ray long survived, and whose works he edited. From the days of Aristotle, zoology had never been prosecuted with such acuteness of observation, accuracy of description, and breadth of philosophical generalization as it was by Willoughby and Ray. The progress of the science now became very rapid. Buffon won for it, by his interesting descriptions and brilliant style, the general attention of the educated portion of society, not only in his own but in other countries, and was almost immediately followed by Linnæus, who, extending his studies from botany to zoology, not only extended the science by his own observations and discoveries, but rendered it far greater service by gathering together the facts ascertained by others, and by the improvement which he effected in classification. Some of the larger groups established by Linnæus have been retained by all subsequent naturalists without essential modification of their characters, and even his smallest groups—genera—have been very generally retained, although now regarded as constituting tribes or families. According to the Linnæan system, the animal kingdom is divided into six great classes, which are further brought together in groups of two each, as follows:

Heart bilocular, with two auricles, blood	Viviparous.	1. Mammalia.
warm, red.	Oviparous.	2. Birds.
Heart unilocular, with one auricle, blood	With lungs.	3. Amphibia.
cold, red.	With gills.	4. Fishes.
Heart unilocular, with one auricle, circu-	With antennæ.	5. Insects.
lating fluid (<i>sarx</i>) cold, white.	With tentacula.	6. Vermes.

The orders into which Linnæus divided these classes have, in the most important instances, been already noticed, either under the classes, or separately. It was, however, in constituting and defining the genera that Linnæus showed in the highest

degree his powers both of observation and arrangement. His labors in the lower departments of the animal kingdom were much less perfect than in the higher; but others speedily entered upon the field, and while new species of animals and their habits continued to be described, the study of comparative anatomy was also diligently prosecuted, and thus preparation was made for a more complete and philosophical system of zoology. The names of Pallas, Hunter, and Blumenbach are particularly worthy to be noticed; but more than any other, the name of Cuvier, who, like Linnaeus, took a comprehensive view of the whole subject of zoology, and carried forward the work of minute observation as well as of generalization. His system of classification is rather an improvement of that of Linnaeus than one fundamentally new, and it has formed a new starting-point for all further progress. The divisions, the classes, and many of the orders of Cuvier's system have already been noticed under their proper heads, so that it may be enough here to give the most general outline of the system, showing Cuvier's four great divisions of the animal kingdom, and the classes which he arranges under them.

DIVISION I. VETEBRATA.....	Class I. <i>Mammalia</i> .
	“ II. <i>Aves</i> (birds).
	“ III. <i>Reptilia</i> (reptiles).
	“ IV. <i>Pisces</i> (fishes).
DIVISION II. MOLLUSCA.....	Class I. <i>Cephalopoda</i> .
	“ II. <i>Pteropoda</i> .
	“ III. <i>Gasteropoda</i> .
	“ IV. <i>Acephala</i> .
	“ V. <i>Brachiopoda</i> .
	“ VI. <i>Cirrhopoda</i> .
DIVISION III. ARTICULATA.....	Class I. <i>Insecta</i> (insects).
	“ II. <i>Crustacea</i> .
	“ III. <i>Arachnida</i> .
	“ IV. <i>Annelida</i> .
DIVISION IV. RADIATA	Class I. <i>Echinodermata</i> .
	“ II. <i>Entozoa</i> .
	“ III. <i>Aculephæ</i> .
	“ IV. <i>Polypi</i> .
	“ V. <i>Infusoria</i> .

The system of Cuvier has been modified by Lamarck, Virey, Duméril, De Blainville, F. Cuvier, and others; and in consequence of the progress of scientific discovery, more considerable changes have recently been proposed by eminent naturalists, some of them amounting almost to a reconstruction of the greater part of the system; while in particular departments, and especially those which contain the lower forms of animal life, Cuvier's arrangement, regarded by himself as merely provisional, may be said to have already become completely antiquated.

A complete system of the animal kingdom has been proposed by Agassiz. He adopts the four great divisions of Cuvier, but makes much change in the subdivisions, acknowledging, however, that much is still uncertain, and that a satisfactory arrangement must depend upon anatomical and embryological researches yet to be made. The following is an outline of his system:

DIVISION I.—RADIATA.

Class I. <i>Polypi</i>	Order 1. <i>Actinoidea</i> .
	“ 2. <i>Haleyonodiceæ</i> .
“ II. <i>Aculephæ</i>	Order 1. <i>Hydroidea</i> (including <i>siphonophoræ</i>).
	“ 2. <i>Discophoræ</i> .
	“ 3. <i>Ctenophoræ</i> .
“ III. <i>Echinodermata</i>	Order 1. <i>Crinoidea</i> .
	“ 2. <i>Asteroidea</i> .
	“ 3. <i>Echinoidea</i> .
	“ 4. <i>Holothuridæ</i> .

DIVISION II.—MOLLUSCA.

Class I. <i>Acephala</i>	Order 1. <i>Bryozoa</i> (including the <i>vorticellidæ</i>).
	“ 2. <i>Brachiopoda</i> .
	“ 3. <i>Tunicata</i> .
	“ 4. <i>Lamellibranchiata</i> .
“ II. <i>Gasteropoda</i>	Order 1. <i>Pteropoda</i> .
	“ 2. <i>Heteropoda</i> .
	“ 3. <i>Gasteropoda</i> proper.
“ III. <i>Cephalopoda</i>	Order 1. <i>Tetrabranchiata</i> .
	“ 2. <i>Dibranchiata</i> .

DIVISION III.—ARTICULATA.

- Class I. *Vermes*..... Order 1. *Trematoideæ* (including *Cestoides*,
Planariæ, and *hirudinidæ*.
 “ 2. *Nematoideæ* (including *acantho-*
cephali and *gordiaceæ*).
 “ 3. *Annelidæ*.
 “ II. *Crustacea*..... Order 1. *Rotifera*.
 “ 2. *Entomostraca* (including *cirrho-*
poda).
 “ 3. *Tetradecapoda*.
 “ 4. *Decapoda*.
 “ III. *Insecta*..... Order 1. *Myriapoda*.
 “ 2. *Arachnida*.
 “ 3. *Insecta* proper.

DIVISION IV.—VERTEBRATA.

- Class I. *Myzonta*..... Order 1. *Myrinoideæ*.
 “ 2. *Cyclostomata*.
 “ II. *Pisces* (fishes proper)..... Order 1. *Ctenoideæ*.
 “ 2. *Cycloideæ*.
 “ III. *Ganoideæ*..... Order 1. *Celacanthiæ*.
 “ 2. *Accipenseroidæ*.
 “ 3. *Sauroidæ*.
 “ 4. *Siluroideæ*.
 “ 5. *Plectognatheæ*.
 “ 6. *Lophobranchiææ*.
 “ IV. *Selachia*..... Order 1. *Chimæreæ*.
 “ 2. *Galeodes*.
 “ 3. *Batides*.
 “ V. *Amphibia*..... Order 1. *Caciliææ*.
 “ 2. *Ichthyodi*.
 “ 3. *Anura*.
 “ VI. *Reptilia*..... Order 1. *Serpentes*.
 “ 2. *Saurii*.
 “ 3. *Rhizodontes*.
 “ 4. *Testudinata*.
 “ VII. *Aves*..... Order 1. *Natatores*.
 “ 2. *Grallæ*.
 “ 3. *Rasores*.
 “ 4. *Insessores* (including *scansores* and
accipitres).
 “ VIII. *Mammalia*..... Order 1. *Marsupialia*.
 “ 2. *Herbivora*.
 “ 3. *Carnivora*.

The three Cuvierian divisions of *vertebrata*, *mollusca*, and *articulata* have been very generally retained by systematic zoologists, without much change as to the classes or even orders of animals included in each, although it is now generally admitted that the *cirrhopoda* are not to be ranked among the *mollusca*, but, as *crustaceans*, among the *articulata*; and the *polyzoa* or *bryozoa*, formerly placed with other “zoophytes” among the *radiata*, have been removed by many naturalists to a place among the *mollusca*. Among the *radiata* of Cuvier great changes have been made: and it may be well to indicate here some of the chief of the new groups which have been proposed, and pretty generally accepted by naturalists, although their proper order and their relations to each other cannot be so well set forth as in those departments of the animal kingdom which have been more thoroughly studied. Greater importance has been assigned by recent naturalists than by their predecessors to the nervous system as a basis of classification. The lowest animals, those in which no trace of a nervous system has been discovered, have been formed into a separate division of the animal kingdom, under the names *acrita* and *protozoa* (q.v.), the latter of which has obtained general preference. Higher in organization than the *protozoa* are the *nematoneura* of Owen, having a nervous system distinctly traceable in a filamentary form, and including all the higher orders of Cuvier’s *radiata*. Some groups, as *anthozoa* (see *ZOOPHYTE*), still occupy a doubtful intermediate place between *protozoa* and *nematoneura*. To the *articulata*, Owen has, with regard to their nervous system, given the name *homogangliata* (q.v.), and to the *mollusca* the name *heterogangliata* (q.v.). In like manner, he has recently introduced in his classification of the *vertebrata* the terms *hematothermal* and *hematocryal*, these being merely words formed from the Greek, and signifying respectively *warm-blooded* and *cold-blooded*, the former including *mammalia* and *birds*, the latter, *reptiles* and *fishes*. Further information about the recent classification of some of the lower groups of animals will be found in the article *WORMS*.

In the study of zoology, far more attention has been paid recently than formerly to the relation which each part of the animal organization bears to the whole, as the respiratory system to the circulatory system, the digestive system, the nervous system, etc. The study of the science has thus become more philosophical, and the view obtained of nature more complete; and if the difficulty of classification is found greater than when characters derived from particular parts of the organization were more exclusively regarded, the result, when fairly wrought out, is a system at once more perfect and more natural.

ZOOPHYTE (derived from the Greek *zōon*, an animal, and *phyton*, a plant, and signifying an animal-plant) is a term which was employed by Cuvier, in the same sense as he employed *radiata*—viz., to designate the lowest primary division of the animal kingdom, which includes many animal organisms that are fixed to a definite spot of rock, shell, etc., and have the form of plants. His zoophytes included the anomalous groups of *infusoria*, *entozoa*, and *radiaria*,* the latter of which was subdivided into the *hydrozoa*, *anthozoa*, *aculeoph*, *echinodermata*, and *bryozoa*.† Subsequent writers excluded the infusoria and entozoa from the zoophytes, and left only those constructed on the radiated type. These were afterward found to present extreme differences of structure, and it became obvious that the lower forms of *hydrozoa* and *anthozoa* could not be associated with the *bryozoa*, which approximate closely to the lower mollusks. The term is now never employed by scientific naturalists.

ZOOSPORE (Gr. *zōos*, living, and *spora*, a seed), in botany, the name given to those spores (q.v.), or seeds of acotyledonous plants, which being furnished with cilia, move spontaneously for a short time after being discharged from the spore-case of the parent plant. The motions of their cilia resemble those of the cilia on the epithelium (q.v.) of the higher animals, and on the external surface of some of the lower tribes, as *aculeoph* (q.v.). In these cases in the animal kingdom, as in this case in the vegetable kingdom, there is no appearance of volition, the motion being probably owing to changes of hygrometric or of electric condition, or of both. The purpose served by the ciliary motion in zoospores is evidently the wider diffusion of seeds; and the cessation of the motion after a certain time permits the seed to become fixed, in order to germination. Zoospores are found in *charace*, *algæ*, *fungi*, and *lichens*. They have often been mistaken by observers with the microscope for animalcules. Similar to them in the property of locomotion, simulating that of animals, is another class of bodies, also connected with the reproduction of acotyledonous plants, called *phytozoa* (q.v.).

ZORN DORF, a village 4 English m. n. of Küstrin, was the scene of the bloodiest of the many desperate conflicts of the *Seven Years' War* (q.v.). The Russians having for the second time been ordered by the czarina Elizabeth to invade Prussia, advanced toward Berlin, committing frightful devastations, while Frederick the great, with the bulk of his forces, was engaged with the Austrians in Silesia and Saxony. The Russians, under Fermor, were 50,000 strong, and easily drove before them Dohna's little Prussian army of 15,000; but Frederick being speedily apprised of this new invasion, hastened northward with such a re-enforcement as raised the army to 30,000; and after taking care, by the breaking down of bridges, etc. to cut off their retreat, engaged the invaders. The battle, which commenced at eight in the morning of Aug. 25, 1758, and lasted till evening, consisted mainly in a succession of furious charges, accompanied with a tremendous artillery-fire, and was not decided till Seidlitz, by an able movement, turned the Russian flank. The Russians, now discovering that they were nearly surrounded, fought with the utmost desperation, and ultimately both armies bivouacked on the field of battle. In the morning, however, Fermor drew off his forces, diminished by 20,000 men, 103 cannon, and 27 standards; having inflicted on the Prussians a loss of 13,000 men, 26 cannon, and a few standards. Generals Soltikof, Czernitchev, and prince Sulkowski were made prisoners by the Prussians on this occasion; and, oddly enough, the first named was the conqueror of Frederick II. in the next great battle between the two northern powers, at Kunersdorf (q.v.).

ZOROASTER, or rather ZARATHUSTRA (which in Greek and Latin was corrupted into ZARASTRADES and ZOROASTRES; while the Persians and Parsees altered it into ZERDUSHTI), is the name of the founder of what is now known as the Parsee religion. The original meaning of the word is uncertain, and though there have been many conjectures formed about it, yet not one of them seems to be borne out by recent investigations. Most probably it only indicates the notion of "chief," "senior," "high-priest," and was a common designation of a spiritual guide and head of a district or province. Indeed, the founder of Zoroastrianism is hardly ever mentioned without his family name—viz., Spitama. He seems to have been born in Bactria. The terms he applied to himself are either Manthran, i.e., a reciter of Manthras; a messenger sent by Ahuramazda; a speaker; one who listens to the voice of oracles given by the spirit of nature; one who receives sacred words from Ahuramazda through the flames. His life is completely shrouded in darkness. Both the Greek and Roman, and most of the Zend accounts about his life and works are legend-

* These terms have been introduced since the time of Cuvier—the former, we believe, by Owen; and the latter by Farre.

ary and utterly unhistorical. In the latter, he is to a great extent represented, not as a historical but as a dogmatical personality, vested with superhuman or rather divine powers, standing next to God, above the archangels themselves. His temptations by the devil, whose empire is threatened by him, form the subject of many traditional reports and legends. He is represented as the abyss of all wisdom and truth, and the master of the whole living creation. "We worship"—so runs one of the prayers in the Fravardin Yasht—"the rule and the guardian angel of Zarathustra Spitama, who first thought good thoughts, who first spoke good words, who first performed good actions, who was the first priest, the first warrior, the first cultivator of soil, the first prophet, the first who was inspired, the first who has given to mankind nature, and reality, and word, and hearing of word, and wealth, and all good things created by Mazda, which embellish reality; who first caused the wheel to turn among gods and men, who first praised the purity of the living creation and destroyed idolatry, who confessed the Zarathustrian belief in Ahuramazda, the religion of the living God against the devils. . . . Through whom the whole true and revealed word was heard, which is the life and guidance of the world. . . . Through his knowledge and speech the waters and trees become desirous of growing; through his knowledge and speech all beings created by the Holy Spirit are uttering words of happiness."

In the old Yazna (see ZEND-AVESTA) alone, he appears like a living reality, a man acting a great and prominent part both in the history of his country and that of mankind. His father's name seems to have been Pourushâspa, and that of his daughter, the only one mentioned of his children, Pouruchista. Very obscure, however, remains, even by this account, the time when he lived. The dates generally given are as follows: Xanthos of Lydia places him about 600 years before the Trojan war; Aristotle and Eudoxus place him 6,000 years before Plato; others, again, 5,000 years before the Trojan war. Berosus, a Babylonian historian, makes him a Babylonian king, and the founder of a dynasty which reigned between 2300 and 2000 B.C. over Babylon. The Parsees place him at the time of Hystaspes, Darius's father, whom they identify with a king mentioned in the Shâh-Nâmeh (q.v.), from whom, however, Hystaspes is totally distinct. This account would place him at about 550 B.C. Yet there is scarcely a doubt that he must be considered to belong to a much earlier age, not later than 1000 B.C.; possibly he was a contemporary of Moses. It is almost certain that Zoroaster was one of the Sosh-yantôs, or fire-priests, with whom the religious reform, which he carried out boldly, first arose. These were probably at first identical with the Vedic Atharvans (fire-priests), as indeed Zoroastrianism is merely an advanced stage of Brahmanism. The former creed, that of Ahura, by way of eminence, transformed, after the outbreak of the schism, the good beings of the latter into devils or devas; e.g., the purely Brahmanic Indra, Sharva, Nâsatya, etc.—unless it promoted them into saints and angels (yagatas). The conflict that led to this schism between the Iranians and those Aryan tribes which immigrated into Hindustan proper, and whose leaders became afterward founders of Brahmanism, sprung from many social, political, and religious causes. The Aryans seem to have originally led a nomad life, until some of them, reaching, in the course of their migrations, lands fit for permanent settlements, settled down into agriculturists. Bactria and the parts between the Oxus and Jaxartes seem to have attracted them most. The Iranians became gradually estranged from their brother tribes, who adhered to their ancient nomad life; and by degrees, the whilom affection having turned into hatred, considered those peaceful settlements a fit prey for their depredations and inroads. The hatred thus nourished, by further degrees included all and everything belonging to these devastators; even their religion, originally identical with that of the settlers. The "Deva religion" became, in their eyes, the source of all evil. Molded into a new form, styled the "Ahura" religion, the old elements were much more changed than was the case when Judaism became Christianity. Generation after generation further added and took away, until Zarathustra, with the energy and the clear eye that belongs to exalted leaders and founders of religions, gave to that which had originally been a mere reaction and spite against the primitive "Brahmanic" faith a new and independent life, and forever fixed its dogmas, not a few of which have sprung from his own brains.

It is, as we said in the article on the ZEND-AVESTA, chiefly from the Gâthas that Zarathustra's real theology, unmutated by later ages, can be learned. His leading idea was monotheism. Whatever may have caused the establishment of the dualism of gods, the good and the evil in the Persian religion—a dualism so clearly marked at the time of Isaiah that he found it necessary to protest emphatically against it—it was not Zoroaster who proclaimed it. His dualism is of a totally different nature. It was merely the principle of his speculative philosophy—a supposition of two primeval causes of the real and the intellectual world. His moral philosophy, on the other hand, moved in a triad—thought, word, and deed. There is no complete system of Zoroastrian philosophy to be found in the Zend-Avesta, any more than there is a developed Platonic system laid down explicitly in the Platonic writings; but from what is to be gathered in the documents referred to it cannot be doubted that Zoroaster was a deep and great thinker, far above his contemporaries and even many of the most enlightened men of subsequent ages. If proof were needed for the high appreciation in which he was held in antiquity, it might be found in the circumstance that even the Greeks and Romans, not particu-

larly given to overrating foreign learning and wisdom, held him in the very highest estimation, as may be seen by their reiterated praises of the wisdom of him whose name they scarcely knew how to pronounce.

With regard, then, to the first point, his monotheism, it suffices to mention that while the fire-priests before him, the Soshyantôs, worshiped a plurality of good spirits called Ahuras, as opposed to the Indian devas, he reduced this plurality to a unity. This one supreme being he called Ahurô Mazdaô (that Ahura which is Mazdao), or the creator of the universe—the Auramazda of the cuneiform inscriptions of the Achemenidian kings, the Ahurmazd of Sassanian times, and the Hormazd or Ormazd of modern Parsees. This supreme god is by Zoroaster conceived to be “the creator of the earthly and spiritual life, the lord of the whole universe, at whose hands are all the creatures.” The following extract from the Gâtha (Ustavaiti) will leave no doubt on that much-contested point: “Blessed is he, blessed are all men to whom the living wise God of his own command should grant those two everlasting powers (viz., immortality and wholeness). . . . I believe thee, O God, to be the best thing of all, the source of light for the world. Everybody shall choose thee as the source of light, thee, thee, holiest spirit Mazda! Thou createst all good things by means of the power of thy good mind at any time, and promitest us, who believe in thee, a long life. I believe thee to be the powerful holy god Mazda! for thou givest with thy hand, filled with helps, good to the pious man, as well as to the impious, by means of the warmth of the fire strengthening the good things. From this reason, the vigor of the good mind has fallen to my lot. . . . Who was in the beginning the father and the creator of truth? Who showed to the sun and the stars their way? Who causes the moon to increase and wane, if not thou? . . . Who is holding the earth and the skies above it? Who made the waters and the trees of the field? Who is in the winds and in the storms, that they so quickly run? Who is the creator of the good-minded beings, thou wise? Who made the lights of good effect and the darkness? Who made the sleep of good effect and the activity? Who made morning, noon, and night?” Ahuramazda is thus to Zoroaster the light and the source of light. He is wisdom and intellect; he possesses all good things, temporal and spiritual, among them the good mind, immortality, wholeness, the best truth, devotion, piety, and abundance of all earthly good. All these gifts he grants to the pious man who is pure in thought, word, and deed. He rewards the good and punishes the wicked, and all that is created, good or evil, fortune or misfortune, is his work alone.

We spoke of Zoroaster's philosophical dualism, and of its having often been confounded with theological dualism, which it is certainly very far from being. Nothing was further from Zoroaster's mind than to assume anything but one supreme being, one and indivisible. But that everlasting problem of all thinking minds—viz., the origin of evil, and its incompatibility with God's goodness, holiness, and justice—he attempted to solve by assuming two primeval causes, which, though different, were united, and produced the world of the material things as well as that of the spirit. The one who produced the *reality* (gaya) is called Vohu Mano, the good mind; the other, through whom the non-reality (ajyâit) originated, is the Akem Manô, the naught mind. To the first belong all good, true, and perfect things; to the second, all that is delusive, bad, wicked. These two aboriginal moving causes of the universe are called twins. They are spread everywhere, in God as in men. When united in Ahuramazda, they are called Cpentô Mainyus and Angrô Mainyus—i.e., white or holy; and dark spirit. It is only in later writings that these two are supposed to be opposed to each other, not within Ahuramazda, but without—to stand, in fact, in the relation of God and devil to each other. The inscriptions of Darius know but one god, without any adversary whatsoever. But while the one side with him produced all that was bright and shining, all that is good and useful in nature, the other side produced all that is dark and apparently noxious. Both are as inseparable as day and night, and, though opposed to each other, are indispensable for the preservation of creation. The bright spirit appears in the blazing flame, the presence of the dark is marked by the wood converted into charcoal. The one has created the light of the day, the other the darkness of night; the former awakens men to their duty, the other hurls them to sleep. Life is produced by the one, and extinguished by the other, who also, by releasing the soul from the fetters of the body, enables her to go up to immortality and everlasting life.

We have said already that the original monotheism of Zoroaster did not last long. False interpretations, misunderstandings, changes, and corruptions crept in, and dualism was established in theology. The two principles then for the first time became two powers, hostile to each other, each ruling over a realm of his own and constantly endeavoring to overthrow the other. This doctrine, which appears first fully developed in the Vendidad, once accepted by some of the most influential leaders, it soon followed that, like terrestrial rulers, each of the two powers must have a council and a court of his own. The number of councilors was six, each having to rule over some special province of creation; but Ahuramazda, who at first merely presided over this council, came gradually to be included in their number, and we then read of seven instead of the usual six Ameshaspentas, or immortal saints. These six supreme councilors, who have also found their way into the Jewish tradition embodied in the Talmud, are both by etymology and the sense of the passages in which they figure, distinctly seen to be but abstract nouns or ideas, representing the

gifts which God grants to all those who worship with a pure heart, who speak the truth, and perform good actions. The first of these angels or principles (*Vohu Mano*) is the vital faculty in all living beings of the good creation. He is the *son* of Ahuramazda, and penetrates the whole living good creation. By him are wrought all good deeds and words of men. The second (*Ardibehesht*) represents the blazing flame of fire, the light in luminaries, and brightness and splendor of any and every kind. He represents, as the light, the all-pervading, all-penetrating Ahuramazda's omnipresence. He is the preserver of the vitality of all life and all that is good. He thus represents providence. The third presides over metals, and is the giver of wealth. His name is *Sharavar*, which means possession, wealth. The fourth (*Issandarmat* = Devotion) represents the earth. It is a symbol of the pious and obedient heart of the true Ahuramazda worshiper, who serves God with his body and soul. The two last (*Khordâd* and *Amerdât*) preside over vegetation, and produce all kinds of fruit. But apart from the celestial council stands *Sraosha* (*Serost*) the archangel, vested with very high powers. He alone seems to have been considered a personality. He stands between God and man, the great teacher of the prophet himself. He shows the way to heaven, and pronounces judgment upon human action after death. He is, in the *Yasna*, styled the sincere, the beautiful, the victorious, who protects our territories, the true, the master of truth. "For his splendor and beauty, for his power and victory," he is to be worshiped and invoked. "He first sang the five Gâthas of Zarathustra Spitama;" that is, he is the bearer and representative of the sacred tradition, including the sacrificial rites and the prayers. He is the protector of all creation, for "he slays the demon of destruction, who prevents the growth of nature, and murders its life. He never slumbers but is always awake. He guards with his drawn sword the whole world against the attacks of the demons, endowed with bodies after sunset. He has a palace of 1000 pillars, erected on the highest summit of the mountain *Alborj*. It has its own light from inside, and from outside it is decorated with stars. . . . He walks teaching religion round about the world." In men who do not honor him by prayer, the bad mind becomes powerful, and impregnates them with sin and crime, and they shall become utterly distressed both in this life and in the life to come.

In the same manner as Ahuramazda, his counterpart, *Angrômainyus*, was in later times endowed with a council, imitated from the one just mentioned, and consisting of six devas, or devils, headed by *Angrômainyus* himself, who is then styled *Devâtana Devo* = arch-devil. The first after him is called *Ako Mano*, or Naught Mind, the original "non-reality," or evil principle of Zoroaster. He produces all bad thoughts, makes man utter bad words, and commit sin. The second place is taken by the Indian god *Indra*; the third by *Shiva* or *Shaurva*; the fourth, by *Naonhaitya*—the collective name of the Indian *Ashuras* or *Diseuri*; the fifth and sixth, by the two personifications of "darkness" and "poison." There are many devas, or devils, besides to be found in the *Zend-Avesta*, mostly allegorical or symbolical names of evils of all kinds. While the heavenly council is always taking measures for promoting life, the infernal council is always endeavoring to destroy it. They endeavor to spread lies and falsehoods, and altogether coincide together with their great chief, with the devil and the infernal hierarchy of the New Testament.

Thus monotheism was in later times broken up and superseded by dualism. But a small party, represented by the *Magi*, remained steadfast to the old doctrine, as opposed to that of the followers of the false interpretation or *Zend*, the *Zendikis*. In order to prove their own interpretation of Zoroaster's doctrines, they had recourse to a false and ungrammatical explanation of the term *Zervana Akarana*, which, merely meaning time without bounds, was by them pressed into an identity with the Supreme Being; whilst the passages on which the present *Destars*, or *Parsee* priests, still rest their faulty interpretation, simply indicate that God created in the boundless time, i.e., that He is from eternity, self-existing, neither born nor created. Two intellects and two lives are further mentioned in the *Zend-Avesta*. By the former are to be understood the heavenly, spiritual wisdom, and the earthly wisdom, i.e., that which is learned by ordinary teaching and experience. The two lives are in the same manner distinguished as the bodily and the mental, i.e., body and soul. From these two lives, however, are to be distinguished the "first" and "last" lives, terms which refer to this life and the life to come. The belief in the latter, and in immortality, was one of the principal dogmas of Zoroaster, and it is held by many that it was not through Persian influence that it became a Jewish and a Christian dogma. Heaven is called the "house of hymns," a place where angels praise God incessantly in song. It is also called the "best life," or paradise. "Hell" is called the house of destruction. It is the abode chiefly of the priests of the bad (*deva*) religion. The modern Persians call the former *Behesht*; the latter, *Duzak*. Between heaven and hell there is the bridge of the gatherer or judge, over which the soul of the pious passes unharmed, while the wicked is precipitated from it into hell. The resurrection of the body is clearly and emphatically indicated in the *Zend-Avesta*; and it belongs, in all probability, to Zoroaster's original doctrine—not, as has been held by some, to later times, when it was imported into his religion by other religions. A detailed description of the resurrection and last judgment is contained in the *Bundehesh*. The same argument—the almightiness of the Creator—which is now employed to show the possibility of the elements, dissolved and scattered as they may be, being all brought

back again, and made once more to form the body to which they once belonged, is made use of there to prove the resurrection. There is still an important element to be noticed—viz., the Messiah, or Sosiosh, from whom the Jewish and Christian notions of a Messiah are held, by many, to have been derived. He is to awaken the dead bodies, to restore all life destroyed by death, and to hold the last judgment. Here, again, a later period introduced a plurality, notably a trinity. Three great prophets are also to appear when the end of the world draws nigh, respectively bearing the names of Moon of Happy Rule, Aurora of Happy Rule, and Sosiosh, who is supposed to be the son of Zarathustra, begotten in a supernatural way; and he will bring with him a new portion of Zend-Avesta, hitherto hidden from man. Even a superficial glance at this sketch will show our readers what very close parallels between Jewish and Christian notions on the one hand, and the Zoroastrian on the other, are to be drawn; but, as we have noticed under PARSEES (q. v.), an attentive reading of the Zend-Avesta reveals new and striking points of contact almost on every page.

We have in the foregoing sketch mainly followed Haug, the *facile princeps* of Zend studies in these days; but we have also taken into account the views of Windischmann, Spiegel, and other prominent investigators, and principally by quoting the words of the sacred sources themselves, when feasible, put our readers in a position to judge on the main points for themselves. We cannot, however, do better than thus briefly summarize, in conclusion, the principal doctrines of Zoroaster, as drawn from a certain speech (contained in the Gâthas), which, in all probability, emanates from Zoroaster himself.

1. Everywhere in the world, a duality is to be perceived, such as the good and the evil, light and darkness; this life and that life, human wisdom and divine wisdom. 2. Only this life becomes a prey of death, but not that hereafter, over which the destructive spirit has no power. 3. In the universe, there are from the beginning two spirits at work, the one making life, the other destroying it. 4. Both these spirits are accompanied by intellectual powers, representing the ideas of the Platonic system on which the whole moral world rests. They cause the struggle between good and evil, and all the conflicts in the world, which end in the final victory of the good principle. 5. The principal duty of man in this life is to obey the word and commandments of God. 6. Disobedience is punished with the death of the sinner. 7. Ahuramazda created the idea of the good, but is not identical with it. This idea produced the good mind, the Divine Spirit, working in man and nature, and devotion—the obedient heart. 8. The Divine Spirit cannot be resisted. 9. Those who obey the word of God will be free from all defects, and immortal. 10. God exercises his rule in the world through the works prompted by the Divine Spirit, who is working in man and nature. 11. Men should pray to God and worship him. He hears the prayers of the good. 12. All men live solely through the bounty of God. 13. The soul of the pure will hereafter enjoy everlasting life; that of the wicked will have to undergo everlasting punishment—i.e., as modern Parsee theologians explain, to the day of the resurrection. 14. All creatures are Ahuramazda's. 15. He is the reality of the good mind, word, and deed." See PARSEES, GUEBRES, ZEND, ZEND-AVESTA, etc.

ZOSIMUS, of Constantinople, a Greek historian, who lived in the 5th c., A.D. He wrote the history of the Roman emperors, in six books, from Augustus to 410 A.D. His style is concise, clear, and interesting. He seeks to unfold the causes of the decline of the empire, and being himself a pagan, he adduces as the chief, the neglect of the pagan religion which attended the progress of Christianity. The unsparing severity with which he assails various Christian emperors, especially Constantine, has been considered by some (e.g., Bentley) to detract from his credibility as a historian. From his own point of view, he shows a considerable degree of acuteness in his remarks. Nothing is known of his personal history.

ZOSIMUS, Pope, and successor of Innocent I., requires a brief notice on account of his connection with the history of the heresiarch Pelagius (q. v.). Zosimus was a Greek by birth, and was elected bishop of Rome, Mar. 1, 417. The African bishops had condemned the opinions of Pelagius, and this judgment had been ratified by pope Innocent. In the interval, however, Pelagius appealed to the pope; and his disciple, Celestius, came in person to Rome, where he presented a confession of faith in his own justification. Zosimus, having convened a council of bishops and submitted this to them, was induced by the specious explanations of Celestius to suspend the judgment, and even to write to the African bishops, recommending a reconsideration of the case. This apparent conflict of Zosimus with his predecessor, although it has been used by the Gallican as well as Protestant controversialists as an argument against papal infallibility, was nevertheless only temporary. On further examination of Celestius, Zosimus became sensible that he had been deceived; and even before the reply of the African bishops, confirmed and renewed their original condemnation of the Pelagian doctrine. He died Dec. 26, 418. His letters, which are curious and interesting, are found in Constant's *Epistolæ Romanorum Pontificum*.

ZOUAVES (Arab. *Zu'awa*), a body of troops in the French army, which derives its name from a tribe of Kabyles, inhabiting the mountains of Jurjura, in the Algerian province of Constantine. Long previous to the invasion of Algiers by the French, these Kabyles had been employed as hired mercenaries in the service of the rulers of Tripoli,

Tunis, and Algiers; and after the conquest of the last-named country in 1830, the French, in the hope of establishing a friendly feeling between the natives and their conquerors, took the late dey's mercenaries into their service, giving them a new organization. Accordingly gen. Clausel created, in 1830, two battalions of zouaves, in which each company consisted of French and Kabyles in certain proportions, officers, subalterns, and soldiers being selected from either race; the zouaves, though retaining their Moorish dress, were armed and disciplined after the European fashion; and the battalions were recruited by voluntary enlistment. As it was soon found, however, that the system of commingling the two races did not effect the object intended, the French and Kabyles were formed into separate companies; and in 1837 they were divided into three battalions, and put under the command of a colonel. Their first col. was Lamoricière, who mainly effected their reorganization, and under whom, as well as his successor, Cavaignac (q.v.), they distinguished themselves in many a bloody conflict with the Arabs of the south. Gradually, however, the native element was eliminated, and since 1840 they may be considered as French troops in a Moorish dress. In 1852 to 1855 their numbers were greatly augmented, and they now amount to upward of 10,000 men, divided into four regiments of four battalions each. They are recruited from the veterans of the ordinary infantry regiments who are distinguished for their fine "physique" and tried courage and hardihood; clad in a loose jacket and waistcoat of dark-blue cloth ornamented with yellow braid, loose madder-colored trousers, brown cloak, madder-colored Fez cap with a yellow tassel, surrounded by a green turban, a light-blue sash of wool, yellow leather leggings, and white gaiters; and armed with a carbine and sword-bayonet. The uniform of the officers and subalterns is the same as that of the hussars.

When the French and the African elements of the original zouave battalions were separated, the Africans were constituted into a separate body, under the name of Algerian tirailleurs, a force still recruited in Algiers to form a part (three regiments) of the regular French army. They are better known as *Tarcos*.

ZSCHOKKE, JOHANN HEINRICH DANIEL, one of the most eminent German authors of this century, was b. at Magdeburg on Mar. 22, 1771. On leaving school at the age of 17, he joined a company of players in the capacity of a dramatic author. He traveled with them for some time, after which he entered the university of Frankfurt. There he seems to have studied all subjects from divinity to administration (*Kameralwissenschaften*). He at the same time acted as a private teacher, and published plays which brought him some reputation, but no pay. In 1795 he was disappointed in obtaining the post of ordinary professor, for which he applied, and set out on a tour through Germany and France. He settled finally at Reichenau, in the Grisons, where he opened a boarding-school. So much pleased were the governing bodies of the canton with his establishment, that they presented him with the citizenship. In return for this favor, he wrote a history of the Grisons, published at Zürich in 1798 (*Geschichte des Freistaats der drei Bünde in Rhätien*). In the same year, however, Zschokke became unpopular in the canton by advocating its annexation to the Helvetic republic established by the French, and his school was in consequence closed. He removed to Aarau, then the seat of government, where he was employed as a commissioner to settle the affairs of Unterwalden, Uri, Schwyz, and Zug, a trust which he discharged with the utmost ability and good temper. The benevolent interest, indeed, which he manifested in the sufferings of the population has made his name memorable as a national benefactor. It would be tedious to enumerate the political and administrative affairs in which Zschokke was actively engaged after this period; we find him at one time protesting against the arbitrary proceedings of the French, and at another pointing out the prudence of concession, but always taking a course marked by practical sagacity and wisdom. In 1804 he was presented with the citizenship of Aargau and appointed inspector of woods and mines. In the same year he founded the Swiss messenger (*Schweizerboten*), a publication which rapidly became popular. It was followed by the Miscellany of the Latest News (*Miscellen für die neueste Weltkunde*), which was continued down to 1813. In 1811 he added a monthly periodical, the *Erheiterungen*, to these publications. He died at Aargau, June 27, 1848. Zschokke's works are very numerous, and are always characterized by sound information, good sense, and a vigorous and effective eloquence. The most important of his historical works, not mentioned above, are *History of the Forest Cantons*, a *History of Bararia*, a *Popular History of Switzerland*. His novels or tales are more numerous and better known; among the best are *The Creole*, *Alamontade*, *Jonathan Frock*, *Clementine*, *Oswald*, and *Meister Jordan*. As a poet and play-writer, Zschokke has less merit. The most popular of all his writings was the *Hours of Devotion*, a Sunday periodical: it supplied a complete exposition of modern rationalism, and yet displayed such zeal and eloquence in the cause of sound morality, that it met with approbation from persons of all creeds. It has gone through 40 German editions, and, with many other works of Zschokke, has been translated into English. A collected edition of works of Zschokke (Aarau, 1825). See *Life of Zschokke*, by Munch (Haag, 1831); and *Autobiography*, Eng. tran. (1845).

ZSCHOPPAU, a t. of Saxony, in the circle of Zwickau, and about 26 m. e. of the town of that name, on the river Zschoppau. It has a castle and two churches; manufactures of

hosiery, cloth, lace, etc.; weaving, wool-spinning, dyeworks, bleach-fields. Pop. '75, 8,045.

ZUG, the smallest of the Swiss cantons, is about 14 m. in length by 10 in width. Pop. '70, 20,993; '77, 21,915. The south-eastern part of the canton borders on the Alpine region, and is hilly and pastoral; the north-western part, sloping to the plain of Switzerland, and inclosing a great part of the lake of Zug, is a rich and beautiful country of cornfields and orchards. The chief exports of Zug are dried fruit, cattle, and the products of the dairy. Zug is a representative democracy, all citizens above 19 enjoying the franchise. There are two councils, one consisting of 67 members, which discharges legislative functions, and another consisting of 11 members, which conducts the administration. The inhabitants speak Swiss-German, and are Roman Catholic. The battle of Morgarten, which founded the independence of Switzerland, was fought on the frontier of this canton in 1315; but it was not till 1352 that Zug joined the Swiss confederation.—Zug the capital of the canton, has a pop. of about 4,300.

ZUIDER ZEE, a large gulf penetrating deep into the Netherlands, between 52° 26' and 53° 20' n. lat., is about 60 m. in length, and 210 m. in circumference. The islands Texel, Vlieland, Ter Schelling, Ameland, and Schiermonnikoog, reaching in a chain from the most northern point of Holland, are the remains of the former line of coast, which form a breakwater against the North sea. From Dunkirk in French Flanders to the n. of Holland, the interior is defended from the sea by sand-hills or dunes. Here, as at the mouth of the Scheldt, the sand-barrier was broken, and the waters, overflowing the low lands, separated the province of Friesland from the peninsula of North Holland, and having united with the small inner lake Flevo, formed the present Zuider Zee. The decisive inundation occurred in 1282.

In the Zuider Zee lie the islands of Wieringen, Urk, Schokland, and Marken, with a pop. of about 5,000 souls. Fishing is the principal industry. The light-tower on the e. point of Marken stands in 52° 27' 37" n. lat.; and the inhabitants are a hardy, industrious, and independent people, who live by fishing and exporting meadow-lay. They cling tenaciously to their old customs, and never marry except among themselves. The houses are built on artificial mounds, or "hills of refuge;" and the island being liable to frequent and heavy floods, few cows or sheep are kept, no gardens or trees planted, the necessities of life being almost all brought from the main-land.

From the s.e. of the Zuider Zee, a long narrow arm, called the Y (pronounced *I*), formerly ran nearly due w. through the peninsula of Holland. A strong sea-dyke and locks have been constructed to cut off the Zuider Zee from the Y, through which a broad ship-canal has been made between Amsterdam and the North sea, on which a new harbor is approaching completion. On both sides of the new canal the Y has been drained and turned into about 12,000 acres of rich land. The new water-way was formally opened by the king in 1876. It is proposed to make a dyke from the mouth of the Yssel to Enkhuysen, and drain the central part of the Zuider Zee, making room for 200,000 inhabitants, and adding nearly 500,000 acres to the arable land of the Netherlands.

ZULU, or **AMAZULU**, is the name of that portion of the Kaffer race who inhabit Natal and the region n.e. of it, until they gradually merge into the mere negro of the e. coast, n. of the Zambesi. The Kaffer organization appears to hold an intermediate place between that of the negro and a higher type; and as we go s. and w. from the swamps and malaria of Delagoa bay and Sofala to the more healthy and bracing regions of Natal and independent Kaffraria, the Kaffer features appear, as it were, to grow more refined—the mouth protrudes less, the lips are less thick, and the nose assimilates more to that of the European, although the distinguishing type of woolly hair may still continue.

The Zulu Kaffer is a far more amiable savage than his brother the Amakosa of the Cape frontier districts. He is less warlike and predatory, more industrious, and far more willing to act in the capacity of a farm-laborer or domestic servant. In language, customs, habits, etc., although certain tribal and local differences occur, yet they may be called common to all the nation, as a Zulu Kaffer has no difficulty in understanding a native of British Kaffraria; and his views of a future state, purchase of wives, etc., are pretty similar. The Zulu is by nature social, light of heart, and cheerful; his affections are gentle, steady, and enduring; his passions are, however, strong, and called out when in a state of war. He is comparatively chaste; crimes which stain European or eastern civilization are unknown to him. He is hospitable and honest, yet greedy and stingy; he is kind to his own family, yet cruel to dumb animals; and whatever the better nature of his impulses may be, yet when his great chief commands war, he is converted into a demon. He is proud, and very easily can distinguish between an English gentleman and the loafing tribe with which too many of our colonies are afflicted. The writer of this article, by the exercise of a little kindness and firmness, has experienced the most utter devotion from individuals of the Kaffer race generally. Their reasoning powers are good, and with an improved education a Zulu rationalist might not disgrace a chair in the Sorbonne.

It is from the Zulu country, however, that those terrible tyrants who so long devastated south-eastern Africa, the chiefs Chaka, Dingaan, Mosilikatze, etc., issued. The training of their subjects to a peculiar mode of warfare spread desolation and havoc for

many years among the Betjuana and other tribes of the interior, until eventually these mighty chiefs with their thousands of followers, fighting, like Homer's heroes, hand to hand, armed with stabbing assagais and shields of ox-hide, the colors of which distinguished the different regiments they were formed into, melted away with broken power into comparative insignificance before the terrible rifles of a few hundred emigrant Dutch Boers, who, in their turn, gave way to the energetic action of the British authorities (see NATAL). The Zulus, although they have very often series intestine wars among themselves, have generally lived on friendly terms with the Natal colonists. That their warlike qualities have not decayed was sufficiently shown in the war that broke out in 1879 between England and Ketchwayo (Cetewayo), the Zulu king. Within a week or two after the British forces crossed the Natal frontier the Zulus inflicted a severe blow on the invaders by surrounding a camp at Isandhlwa and annihilating the defenders. They repulsed several attacks on their strongholds; but, after the British had received reinforcements, were defeated at Ginghilovo, and completely broken by Lord Chelmsford at Ulundi on July 3. The king was captured shortly afterward, and deported to Cape Town. Terms were proposed by Sir Garnet Wolseley in September, and accepted by the Zulu chiefs. The Zulu country, no longer under one supreme ruler, is divided among twelve chiefs, who undertake to suppress the strict and universal military discipline introduced by Chaka, to give a fair trial to accused persons, and abolish witchcraft, and to prevent the importing of arms and ammunition. They are also bound not to make war save with the sanction of the British residents, of whom there are to be four.

A number of missionary societies of the Wesleyan, American, Norwegian, and Episcopal churches labor among these tribes. Considerable interest was some time ago provoked with regard to bishop Colenso's peculiar views for the evangelizing these heathens; and Colenso's Zulu was for a while almost as famous as Macaulay's New Zealander.

The Amafengu tribe, now settled along the Cape frontier, are a broken tribe of Zulus, driven far to the s.w. by Chaka or Dingaan, then reduced to slavery by the Amakosa Kaffers, and freed by Sir B. Durban in the Kaffer war of 1834-35. The principal Zulu tribes are the Amazulu, the Amahute, Amazwazi, and Amatabele. The last emigrated far northward to the mountains which separate the basins of the Limpopo and Zambesi.

ZULULAND. The country lying n.e. of the colony of Natal, between its e. boundary, the Tugela and Umzimyati rivers, and Delagoa bay, is generally known under the name of Zululand, or the Zulu country, inhabited by tribes of Zulu Kaffers. The great coast chain of mountains, which form in the Cape colony the Stormbergen, and further to the n.e. the Kahlamba and Drachenbergen, still continue well defined to the n.e., running parallel to the coast, but 120 m. distant from it, separating the coast region of Zululand from the higher plateaus of the Transvaal, and rising to an average height of 6,000 or 7,000 feet. East of the Tugela river, the country spreads out into large undulating, grassy plains, but sparsely wooded; while toward the foot of the mountains the kloofs afford some excellent timber. The principal rivers are the Umvoluzi or St. Lucia river, which enters the sea about 80 m. n.e. of the Natal frontier; and the Mapoota and its branches, which drain the n. part of the region, and fall into Delagoa bay. The country along the coast between the St. Lucia river and Delagoa bay is very flat, marshy, and unhealthy. A considerable range of mountains, called the Lebombo, run from the Umvoluzi river almost in a northerly direction to beyond Delagoa bay, about half way between the coast and the first range we have mentioned, forming a supporting buttress to a plateau of high level, similar to those so common in the Cape colony and Natal.

This is generally a fertile region, and, as far as the coast-line, is healthy. Sugar, cotton, and other tropical products can be grown as advantageously as in the Natal colony, to which it forms, as it were, an intermediary link between the fever-regions of the e. coast and the more healthy climate of Natal and the Cape colony. The St. Lucia river marks the boundary line beyond which, to the n.e., Europeans cannot live. Up till the outbreak of the war in 1879, no good map of the Zulu country existed, and even yet, of course, we know very little of its geology or mineral productions. None of the rivers are available for inland navigation, although a large lagoon inside the mouth of the St. Lucia river can be ascended for a few miles. The rivers which flow into Delagoa bay from the n. are sluggish streams, often with no perceptible current, and can be ascended a considerable distance. A large quantity of ivory, rhinoceros' horns, hides, etc., are collected in this region by traders from Natal; and cattle, Indian corn, etc., thrive well in the country before the swampy region commences. The principal tribes are all of the Zulu race—the Amazulu inhabiting the region bordering on Natal; the Amahute, Amazwazi, etc., the country in the neighborhood of Delagoa bay. The Portuguese have a very decayed fort and settlement on Delagoa bay, garrisoned by a few mulatto soldiers, and carrying on some trade with the natives and Dutch Boers, in gunpowder, muskets, calico, etc., in exchange for ivory, horns, and other native produce; and a contraband one in slaves is also, we fear, winked at by the authorities, as captures are often made along the coast by our cruisers. The Dutch emigrant Boers, who very much required a port on the sea-board of s.e. Africa, would long since have seized

on Delagoa bay, if it were not from a wholesome dread of the very unhealthy climate, which appears to affect those stalwart sons of the highlands of s.e. Africa more even than it does Europeans or North Americans.

ZULULAND—ZULUS, a region of s.e. Africa, along the Indian ocean; bounded, e. by the Indian ocean, s. by Natal, w. by Transvaal, extending n. to Delagoa bay. The part on the coast, about 120 m. in width, is marshy in the n. between St. Lucia river and Delagoa bay, but in the s. are good pasture plains. From the coast the land gradually rises to a mountain range about 6,000 ft. high. The soil is fertile, producing rice, cotton, sugar, and the usual tropical fruits. The northern part is unhealthy for foreigners. The people belong to the Kaffir race, and are in most respects far superior to the negroes. Generally mild and kind-hearted, they are in war very ferocious. The Portuguese have a small fort on Delagoa bay, garrisoned by mulattces. At the bay there is a small export trade in horn, gold-dust, ivory, and gems, in return for cotton fabrics, gunpowder, and muskets. The American board has had a successful mission among the Zulus since 1836 in the region of port Natal, though it was broken up by war in 1838. In 1879 the English waged a disastrous, costly, and unjust war with the Zulus. When the Transvaal was annexed to England, a district which had been overrun by the Dutch settlers passed under the jurisdiction of the British government. A special commission, to which the claims of Cetywayo, king of the Zulus, and the Boers were referred, decided that the land belonged to the Zulus, and should be surrendered to them immediately. The colonial authorities determined to disregard this decision, and to allow the squatters to remain in the disputed territory. This was the cause of the war. That the English desired to possess the territory of the Zulus is evident from the conditions of the ultimatum sent to Cetywayo. These were the surrender of certain chiefs, changes in marriage customs among the natives, the establishment of a British residency at the king's kraal, and the disbandment of the army. These conditions would have brought the country under British influence. Cetywayo was enraged when he received the proposals, and gave orders for an immediate advance of his army. Three columns of British troops from Natal invaded Cetywayo's territory. Severe battles took place, attended with great loss on both sides. At the battle of Ulundi the Zulus, 15,000 strong, were routed, Cetywayo fled, the army was broken up, and all the important chiefs submitted. Cetywayo was finally captured, and sent a prisoner to England.

ZUMALA-CARREGUY, DON TOMAS, the most distinguished of the generals who supported the cause of Don Carlos during the Spanish civil war of 1833-40, was born in 1789 at Ormaiztegui, in the Biscayan province of Guipuzcoa. Of an aristocratic, though not wealthy family, he was deeply imbued from infancy with royalist sentiments, which gathered strength with increasing years, till they led him, like the Vendean leaders, to sacrifice fortune and life for a prince wholly unworthy of such devotion. At the time of the invasion of the peninsula by Napoleon, Zumala was a student of law at Pampeluna, and like many of the Spanish youth, he deserted his studies to take up arms against the invader, serving in Mina's corps till the close of the war. He afterward served under Quesada in the "army of the faith;" and on the re-establishment of absolutism, was raised to the rank of col., and appointed governor of Ferrol. He displayed excellent administrative qualities; but his decided leaning to the party of the Carlists (though he repelled indignantly all proposals to proclaim Don Carlos king during the life of Ferdinand VII.) becoming known, he was tried by a council of war, and acquitted. In 1832, when the army was purged of all officers suspected of Carlism, Zumala was dismissed, and retired to Pampeluna, where he lived in retirement till the death of Ferdinand and the rising of the Basque population called him to head the Carlist insurrection (Oct. 11, 1833). His motley army was without uniform, ill fed, and ill paid; yet the profound esteem in which "el Tio Tomas" was held by his followers enabled him to maintain an effective discipline. The overwhelming superiority in number of the Christinos, however, forced him to adopt a defensive system of tactics; so, holding the command of Biscay and Navarre, and the strongholds of Fuenterrabia and Irun, to assure his retreat into France, if necessary, he kept his opponents at bay, defeated Rodil in the valley of Amescos (Aug. 1, 1834), routed another force of Christinos at Viana (Sept. 7), gained a second victory in the Amescos valley in the following spring, completely defeating Valdez, after a battle of four days, and routed Iriarte near Guernica. These brilliant successes of his skillful and devoted partisan flattered the too sanguine and somewhat weak-minded Don Carlos with the hope of speedily seating himself on the throne, rendered him less willing than formerly to be guided by the counsels of Zumala, and led him to interfere with the latter's schemes, to his own detriment. Accordingly, after another year's successful fighting with the Christinos, Zumala was ordered to lay siege to Bilbao; but on June 15, 1835, he received a gun-shot wound so severe that he died ten days afterward. With Zumala's death, all hope of success for the Carlists was extinguished; and though the war dragged on desultorily for some years longer, the result was never doubtful. Zumala was as distinguished for generosity and disinterestedness as for fidelity; and so much had he impoverished himself by liberality to his soldiers, that neither his wardrobe nor his treasury supplied the means for his decent interment.—See Henningsen's *Twelve Months' Campaign with Zumala-Carreguy in Navarre and the Basque Provinces* (2 vols., Lond. 1836).

ZUMPT, KARL GOTTLOB, 1792-1849; educated at Heidelberg and Berlin. In 1838 he became prof. of Roman literature at the university of Berlin. His Latin grammar, which appeared in 1818 and was translated into English by Dr. L. Schmitz, was very successful. Among his works, besides editions of Cicero, Quintilian, and Quintus Curtius, are *Annales Veterum Regnorum et Populorum* (1819) and *Die Religion der Römer* (1845).

ZUNZ, LEOPOLD, b. Detmold, Germany, 1794; educated at Berlin, and became a preacher in the German-Jewish synagogue, and for some years teacher in a Jewish school, moving in 1835 to Prague, and again in 1839 to Berlin, where he was director of the normal seminary. He was a scholar and historical critic of the highest rank. In 1845 the government made him a member of the commission for investigating the educational status of the Prussian Jews. He has written books and essays on Hebrew literature, language, and history.

ZURBARAN, FRANCISCO, 1598-1662; b. Spain; studied painting, and imitated the manner of Caravaggio. His works, besides those at court, are found in churches, monasteries, and cathedrals, especially in Madrid and Seville. His "St. Thomas of Aquinas received into Heaven," regarded as his best work, was executed in 1635.

ZÜRICH, a canton on the n.e. frontier of Switzerland, is drained by the Rhine and its tributaries. Pop. '70, 284,786; '77, 296,815. It is traversed by ridges of lofty hills, running n.w. and s.e., between which lie three valleys, forming almost its whole surface—those of the Töss, the Glatt, and the Limmat. The lake of Zürich penetrates Zürich for a distance of 26 m., and connects it with the cantons of Schwyz and St. Gall. Zürich has not a fertile soil, but it is carefully cultivated. A considerable quantity of corn is raised in the canton, though not enough to supply the wants of the population. Vineyards and orchards are numerous; but the pasture lands are of much greater importance, and cattle form the chief wealth of the agricultural population. Zürich was one of the earliest seats of the cotton manufacture in Europe, and the spinning and weaving of cotton are still prosecuted with great success. The silk manufactures are nearly as important; and more recently, the progress made in the manufacture of railway locomotives and other machinery has been a cause of some alarm to English engineers. The mechanics of Zürich divide their attention between agriculture and manufacturing industry, and are among the most prosperous and best educated workmen in Europe. The government of the canton is a representative democracy—all adult citizens of 20 enjoying the franchise. The great council of Zürich is elected chiefly by the citizens, but partly also by its own members. It appoints for four years an executive council of nine members. A desire to give a yet more thoroughly democratic character to the constitution led to the appointment in 1868 of a committee to consider its revision; and now the real decision as to laws, taxes, etc., lies with the people. Zürich returns 14 members to the national council. The population of the canton (663 sq.m.) is German-speaking and Protestant.

ZÜRICH, the capital of the canton of the same name, is situated at the point where the Limmat issues from the lake of Zürich, and unites with its tributary, the Sihl. Its population in 1870 was 21,199. It is one of the most prosperous manufacturing and commercial towns of Switzerland; yet the narrow streets and lofty houses of its older quarters, on the high ground e. of the river, give it the quaint appearance of a mediæval city. There are many interesting old buildings—the most remarkable being the cathedral, erected in the 11th century. The university, the gymnasium, and the school of industry have long enjoyed a high reputation. The town library is extensive; and numerous museums of natural history, etc., indicate the intelligence and cultivated tastes of the population.

ZURUMA, or **ZARUMA**, a t. of Ecuador, South America, on the w. slope of the Andes, about 30 m. from the w. coast, and 90 s. of Guayaquil. It is situated in a mining district—its gold and silver mines having rendered it formerly very populous, but its importance has greatly declined. Pop. about 6,000.

ZUTPHEN, a fortified t. in the Netherlands, province of Gelderland, is beautifully situated on the right bank of the Yssel, where that river is joined by the Berkel, in a picturesque district of country, chiefly under cultivation, and variegated with abundance of wood. It is one of the oldest towns in the kingdom, but has many elegant modern buildings. The fortifications are promenades, from many points of which lovely prospects are obtained.

Zutphen is a station of the state railway from Arnhem to Friesland, and has an extensive trade in wood, bark, and grain. There are factories for weaving and spinning, grain, wool, oil, and paper mills, many tanneries, a soap-boiling establishment, and a large carpet manufactory. The principal building is the Great Church, supposed to have been founded in 1103; it and the Broederenkerk (Church of the Brethren) belong to the Reformed communion; the Roman Catholics, Lutherans, and Baptists have each a church, and the Jews a synagogue. Besides good schools for the ordinary branches of education, there are a grammar-school, school of design, a theater, and a concert-hall. The town has several charitable institutions for the sick, orphans, and old people; also the provincial lunatic asylum, which can receive 220 patients. Pop. Jan. 1, '75, 14,421.

At Rysselt, a village near Zutphen, is a reformatory, called the Netherlands Mettray, in which about 150 boys are educated, and taught farm-labor and various handicrafts. It was founded in 1851, and has done much good. Nearly one-half of the boys have been withdrawn by their parents. The others obtain situations through the directors. The largest number have taken to farm-labor and gardening, for which the reformatory specially prepares them. Many have become soldiers and sailors; others smiths, house-painters, shoemakers, tailors, bakers, bricklayers, house-servants, etc. The institution is maintained by annual contributions, legacies, and a small charge for each boy. The receipts are about £3,500 annually, of which, on an average, a half is from legacies and contributions. The expenditure is about the same.

ZVENIGOROD KA, an old t. of Russia, government of Kiev, on the Tikritsch, a tributary of the Bug, about 98 m. s. of the town of Kiev. Pop. 11,200. The trade and manufactures are not worthy of notice.

ZVORNIK, a t. of Bosnia, which the Austrians, now administrating Bosnia, occupied in 1878 only after severe fighting, is on the Drina, about 60 m. n.e. of Bosna-Serai. The town is strongly fortified, standing on the face of a steep hill, at the summit of which is a strong fortress commanding the valley of the Drina. It has several mosques, Greek and Roman Catholic churches, lead-mines, and a considerable trade in timber. Pop. about 12,000.

ZWEIBRÜCKEN. See **DEUX-PONTS**.

ZWICKAU, a picturesque, irregularly built, ancient-looking t. of Saxony, in a pleasant valley on the left bank of the Mulde, 60 m. s.w. of Dresden. The river is crossed here by three bridges. The town is the capital of the circle of Zwickau, and is the seat of a district court, court of appeal, and other public offices. Of its churches the most noteworthy is that of St. Mary, the finest Gothic edifice in the Erzgebirge, dating from 1453, distinguished by its tall tower, from which an extensive view can be obtained; it contains a very fine altar-piece, by the old German master Wohlgemuth, and other interesting works of art. There are also a splendid court-house and exchange; a cloth hall, a district infirmary; a gymnasium, with a library of 20,000 vols.; a burgher, Catholic, trade, and other schools; an old castle, which has been converted into a workhouse. The town is prosperous, and the population increasing. There are cloth manufactories, breweries, dye-works, chemical works, tanneries, oil and saw mills. The chief source of its wealth, however, and that of the neighboring villages are the rich beds of coal in the surrounding district. There are also large iron-works in the neighborhood. The town is connected by railway with Leipsic, Dresden, and other important places, and has a considerable transit trade. Pop. '75, 31,491.

ZWINGLI, **ULRICH**, one of the most important of the reformers, was b. Jan. 1, 1484, at Wildhaus, in the canton of St. Gall, Switzerland, and was one of eight sons of the *amtman* of that place. He studied first at Bern, then at the university of Vienna, where he devoted himself to philosophy; and afterward at Basel, where, under Wytténbach, he directed his attention to theology. He became pastor in 1506 in Glarus. At this time his studies were chiefly directed to the Latin classics and the church fathers; but having begun to learn Greek in 1513, he from that time devoted himself to the New Testament. He wrote out the epistles of Paul in the original language, and learned them by heart, which was of great service to him afterward in his disputations. In the capacity of army chaplain, he attended the campaigns in Lombardy of the inhabitants of Glarus for the pope against the French, in 1512, 1513, and 1515, for which service he received a pension from the pope till 1517. In 1516 the liberal-minded administrator, Geroldseck, invited him to be preacher in the convent of Maria-Einsiedeln, famous for its pilgrimages. Here Zwingli began to preach against many abuses prevailing in the church; he also called on the bishops of Sitten and Constance to bestir themselves for the improvement of the church under the guidance of the Word of God. So little was he then suspected, that the papal legate, Antonio Pulei, conferred on him, in 1518, the diploma of chaplain to the holy see. He was soon afterward called to Zürich; and he entered on his office as pastor in the great cathedral there, Jan. 1, 1519, with a discourse, in which he declared himself for the pure gospel unfettered by glosses. In this office, to which was joined in 1521 that of canon in the cathedral, he laid the foundation of his subsequent work as reformer. The same cause that had stirred Luther into activity gave the impulse to Zwingli. In 1518 Bernardin Samson, a Franciscan from Milan, came to Switzerland for the purpose of selling indulgences for the benefit of the papal court. Zwingli, who was still in Einsiedeln on Samson's first appearance, opposed him both there and afterward in Zürich with the whole force of his pulpit eloquence, and succeeded so well that Samson was not allowed to enter the town of Zürich. From this time Zwingli, although attacked by the monks and many of his brother canons, advanced with rapid steps in his reforming career; for the magistracy of Zürich supported his measures to such a degree that, as early as 1520, they issued an order throughout their jurisdiction that the Word of God should be taught without human additions. In 1522 the reformation was formally established in Zürich. At this time Zwingli wrote his first book against the fasts of the Roman church; he also began to study the Hebrew language. The offers of high promotion made to him by Adrian VI. could not

make him waver. In Jan., 1523, the government of Zürich invited all theologians to propose to enter the lists with Zwingli to a conference at Zürich, which was attended by 600 clergy and laity. Zwingli had arranged the articles of faith, to the number of 67, which were to be the subject of the conference, and defended them successfully against the attacks of the celebrated Joh. Faber, afterward bishop of Vienna, that the council of Zürich declared in favor of Zwingli's doctrines, and upheld him and his assistants in adhering to them. The second disputation, Oct., 1523, at which Zwingli, before more than 900 people, spoke against the worship of images and the mass, was the cause of the removal of all pictures and statues from the churches of the city of Zürich and its jurisdiction; and this was followed in 1524 by the abolition of the mass. In the same year Zwingli entered into the married state with Anna Rheinhard, aged 43, the widow of a nobleman of the name of Meyer von Knonow. In the following year he published his creed, *Von der Wahren und Falschen Religion* (Of the True and False Religion). He had thus, in a few years, placed the work of reformation in his native land on a solid footing. He now pressed zealously forward in the same course; while the magistracy of Zürich, who all along actively supported him, abolished the begging friars, brought matters relating to marriage before the secular courts, and instituted a better management of church property. On a great many points, Zwingli was at one with Luther and the other German reformers; only, in regard to liturgical matters, he carried out his reform more radically according to the Bible, and rejected the dogma of the presence of Christ in the Lord's-supper. In order to heal the breach that had, as early as 1524, broken out between the two parties of the new religion on the latter point, a meeting between the Saxon and Swiss reformers was brought about by Philip, landgrave of Hesse, at Marburg in 1529. The conference lasted for three days, but little progress was made toward unity of opinion. See SACRAMENTARIAN. In 1531 open war broke out between Zürich on the one side, and the Catholic cantons of Lucerne, Schwyz, Uri, Unterwalden, and Zug on the other; and Zwingli, by command of the council of Zürich, had to take the field with the banner of the canton, which had always been borne by a priest. On Oct. 11 came the conflict; and as their opponents were more than double in number, and also better led, the Zürichers were beaten, and Zwingli was among the fallen. His collected works were published in Zürich in 1545, in 4 vols.; a selection, in 2 vols., appeared in 1819-21, edited by Usteri and Vögelin.—See the lives by Rotermund (1818), Hottinger (1820), Christoffel (1857), and Mörikofer (1869).

Of all the reformers, there is none more fitted to excite our love and respect than Zwingli. Fearlessly honest in purpose; with a clear head and eye for the truth; less violent, if less eloquent than Luther; more candid and open-minded, if less systematic and penetrating in spiritual insight than Calvin; he stands before us quite as original, if not as prominent as these reformers. His work was not so great as theirs, his influence not so extended; but his character was quite as genuine, and his labor, in some respects, quite as enduring.

ZWIRNER, ERNST FRIEDRICH, 1802-61; b. Silesia; studied architecture at Breslau and Berlin. In 1833 he was made architect to the Cologne cathedral, supervised the restoration of the old building, and planned the new n. and s. portals and the transept. Many of the modern churches and palaces in the towns on the Rhine were designed by him.

ZWOLLE, the capital of the Netherlands province of Overijssel, is situated on the Zwarte water, and by the canal called the Willemsvaart has connection with the Yssel. It is one of the finest towns in the kingdom, having many beautiful private and public buildings. Both within and without the gates are pleasant promenades and drives, shaded by large trees. The surrounding country consists of rich meadows and cultivated fields, adorned by pretty country-seats. Zwolle has three extensive suburbs—Diezenpoorten, Kamperpoorten, and Sassenpoorten. It is most favorably situated for commerce, having, by navigable waters and railways, communication with the provinces around the Zuider Zee, Hanover, England, and other maritime nations. The trade in farm-produce and stock is very great. Principal industries are ship-building, tanning leather, rope-spinning, beer-brewing, soap-boiling, weaving calicoes and stockings, book and plate printing, making salt, cooperage, and refining sugar. The most important buildings are the town-house, palace of justice, and great church. There are many excellent charitable institutions; and, besides those for the ordinary branches of education, a flourishing grammar-school, in which pope Adrian VI. was partly educated, and a school of design. Zwolle has a cabinet of natural history, a literary and a musical society. Here the poet Rhyndis Feith (1753-1824) was born, and Thomas à Kempis lived during 71 years. Between 1815 and 1875 the pop. increased from 12,870 to 21,310.

ZYGODACTYLA (Gr. yoke-footed), a name given by some naturalists to a section of *pachydermata*, distinguished by having two principal hoofs upon which the animals walk, so that the foot resembles that of the *ruminantia*. This section includes only one family, the *suidæ*.—The term *ZYGODACTYLOUS* BIRDS is often applied, in ornithology, to those birds which have the toes in pairs, two before and two behind, as most of the *scansores*, or climbers (q.v.).

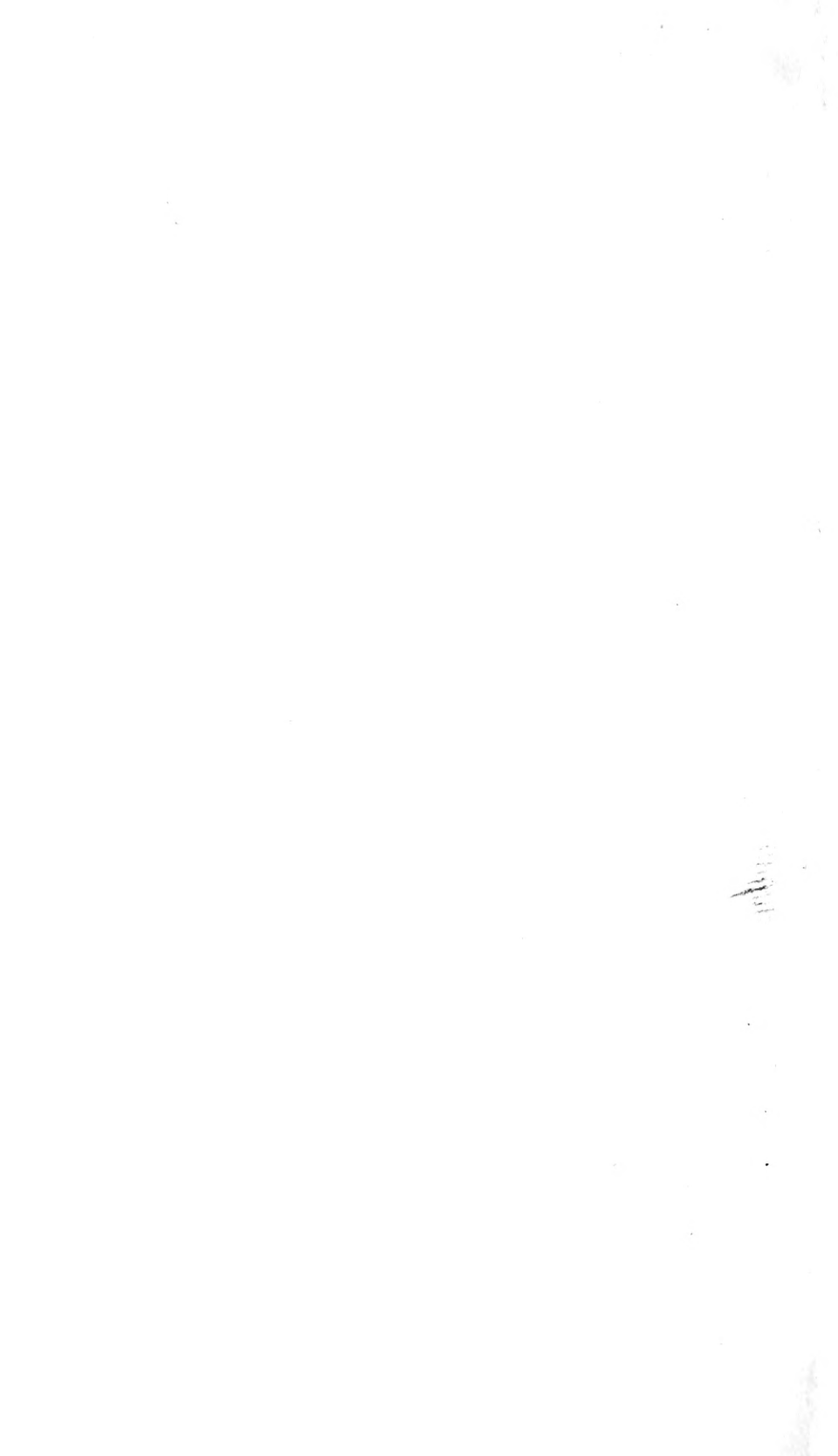
ZYGOPHYLLA CEÆ, a natural order of exogenous plants, allied to *rubiaceæ*, and containing about 100 known species, herbaceous plants, shrubs, and trees, chiefly natives of

sub-tropical countries. They have opposite, generally pinnated leaves, without stipules. The flowers are solitary, or two or three together; the calyx 4 to 5 parted; the petals alternate with the calycine segments, and clawed; the stamens twice as many as the petals, generally rising from the back of small hypogynous scales; the ovary simple, 2 to 5-celled, with two or more ovules in each cell. The fruit is capsular, rarely somewhat fleshy, with 4 or 5 angles or wings. The most important genus is *guaiacum* (q.v.). The abundance of species of *zygophyllum* and some other genera constitutes one of the most striking features of n. African and Arabian deserts. The flowers of *Z. fabago* are employed as a substitute for capers, under the name of *bean-capers*. Those of *melianthus major*, a native of the cape of Good Hope, abound so much in honey that it is obtained from them for use by merely shaking the branches. The Turks use the seeds of *peganum harmala* both as a spice and for dyeing red.

ZYMOTIC DISEASES have been already referred to, and the most important of them are mentioned in the article **NOSOLOGY**. The class of diseases to which Dr. Farr has assigned this now generally accepted term comprises those which are *epidemic*, *endemic*, and *contagious*, as, for example, *fever*, *small-pox*, *plague*, *influenza*, *cholera*, *hooping-cough*, etc. As Dr. Farr observes: "The diseases of this class distinguish one country from another, or one year from another; they have formed epochs in chronology; and as Niebuhr has shown, have influenced not only the fate of cities, such as Athens and Florence, but of empires; they decimate armies and disable fleets; they take the lives of criminals that justice has not condemned; they redouble the dangers of crowded hospitals; they infest the habitations of the poor, and strike the artisan in his strength down from comfort into helpless poverty; they carry away the infant from the mother's breast, and the old man at the end of life; but their direst eruptions are excessively fatal to men in the prime and vigor of age. They are emphatically called the *morbi populares*." It must not be assumed, as the origin of the word (*zymē*, the Gr. for a ferment) might lead the reader to infer, that all the so-called zymotic diseases are true fermentations, for the class is intended to comprehend all the principal diseases which have prevailed as *epidemics* or *endemics*, and all those which are *communicable either by human contact or by animals in a state of disease*, as well as the diseases that result from the *scarcity and the deterioration of the necessary kinds of food*, or from *parasitic animals*. The diseases of this class thus arrange themselves into the four orders of *miasmatic*, *ethetic*, *dietic*, and *parasitic disorders*, of which *fever*, *siphilis*, *scurvy*, and *worms* may be regarded as the types.

Dr. Carpenter, in a memoir on *The Predisposing Causes of Epidemics*, shows that the conditions which give rise to zymotic diseases may be referred to the three following categories: (1.) Conditions which tend to introduce into the system decomposing matter that has been generated in some external source, as, for example, putrescent food, water contaminated by sewage or other decomposing matters, and air charged with miasmatic emanations. (2.) Conditions which occasion an increased production of decomposing matter in the system itself. The best example of this class of conditions is afforded in the puerperal state (or childbed), in which the tissue of the womb is undergoing rapid disintegration, and the decomposing matters which would be harmless at other times, are now able to act upon the blood of the woman, so as to induce that most fatal of all the zymotic diseases, puerperal fever. (3.) Conditions which obstruct the elimination of the decomposing matter normally or excessively generated within the system, or abnormally introduced into it from without. For example, any obstacle to the elimination of urea or uric acid, carbonic acid, biliary matters, lactic acid, etc., gives rise to as true poisoning as if these substances had been injected into the blood-vessels. The most important of the laws by which zymotic poisons are governed are noticed in the article **VIRUS**.

The average annual rate of mortality in this country at the present time is nearly 22 per 1000, or 1 in 45 of the population; and the deaths from zymotic diseases vary from 21 to 26 per cent (or amount to nearly one-fourth) of the total number of deaths. Taken in order of their greatest fatality they would be thus arranged: *cholera*, *typhus* and other forms of continued fever, *scarlatina*, *hooping-cough*, *measles*, *croup*, *small-pox*, *dysentery*, and *erysipelas*—the other diseases being less fatal.—For further information on the subject of this article, the reader is referred to Aitken's *Science and Practice of Medicine*. See **GERM THEORY OF DISEASE**.



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